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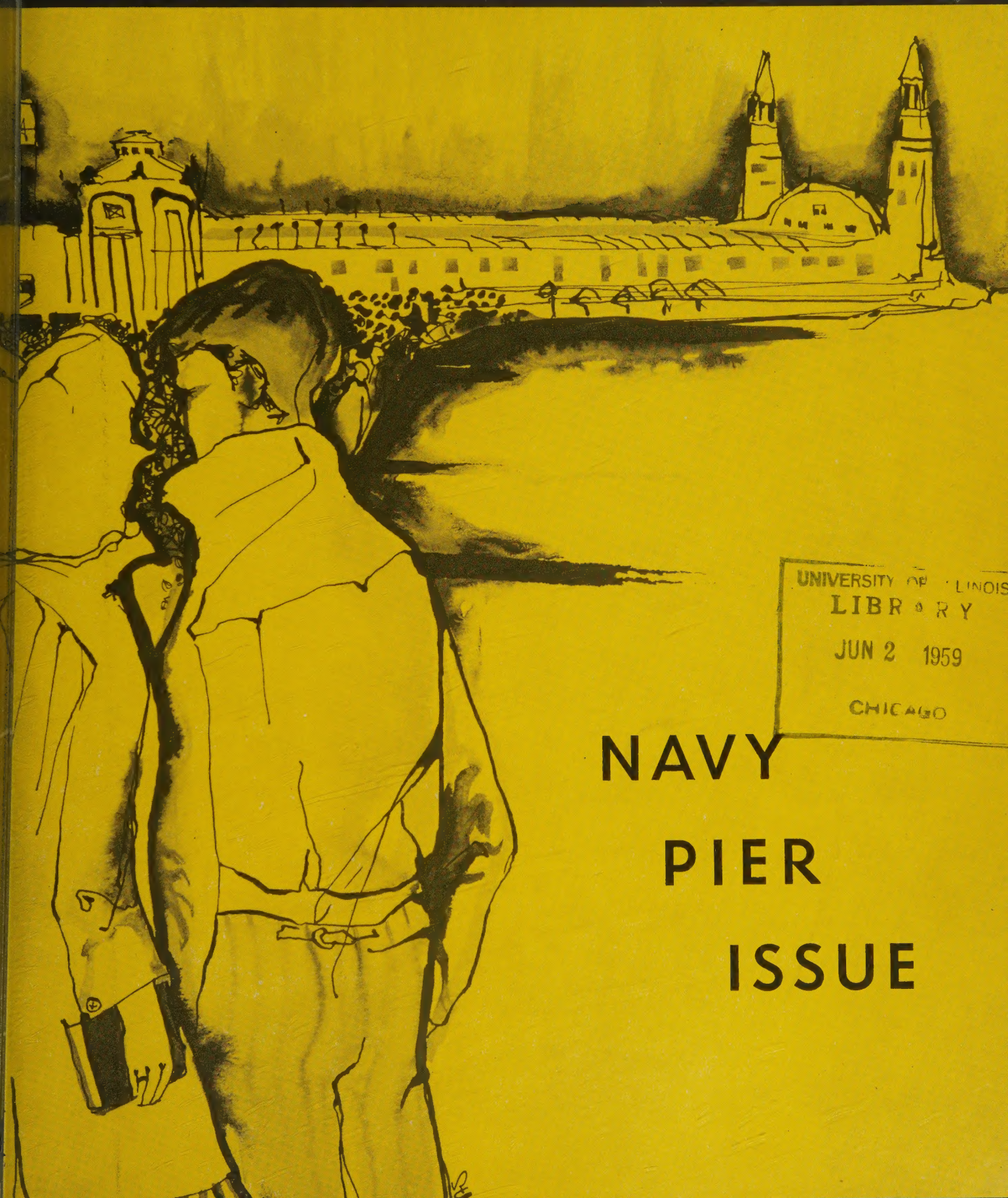

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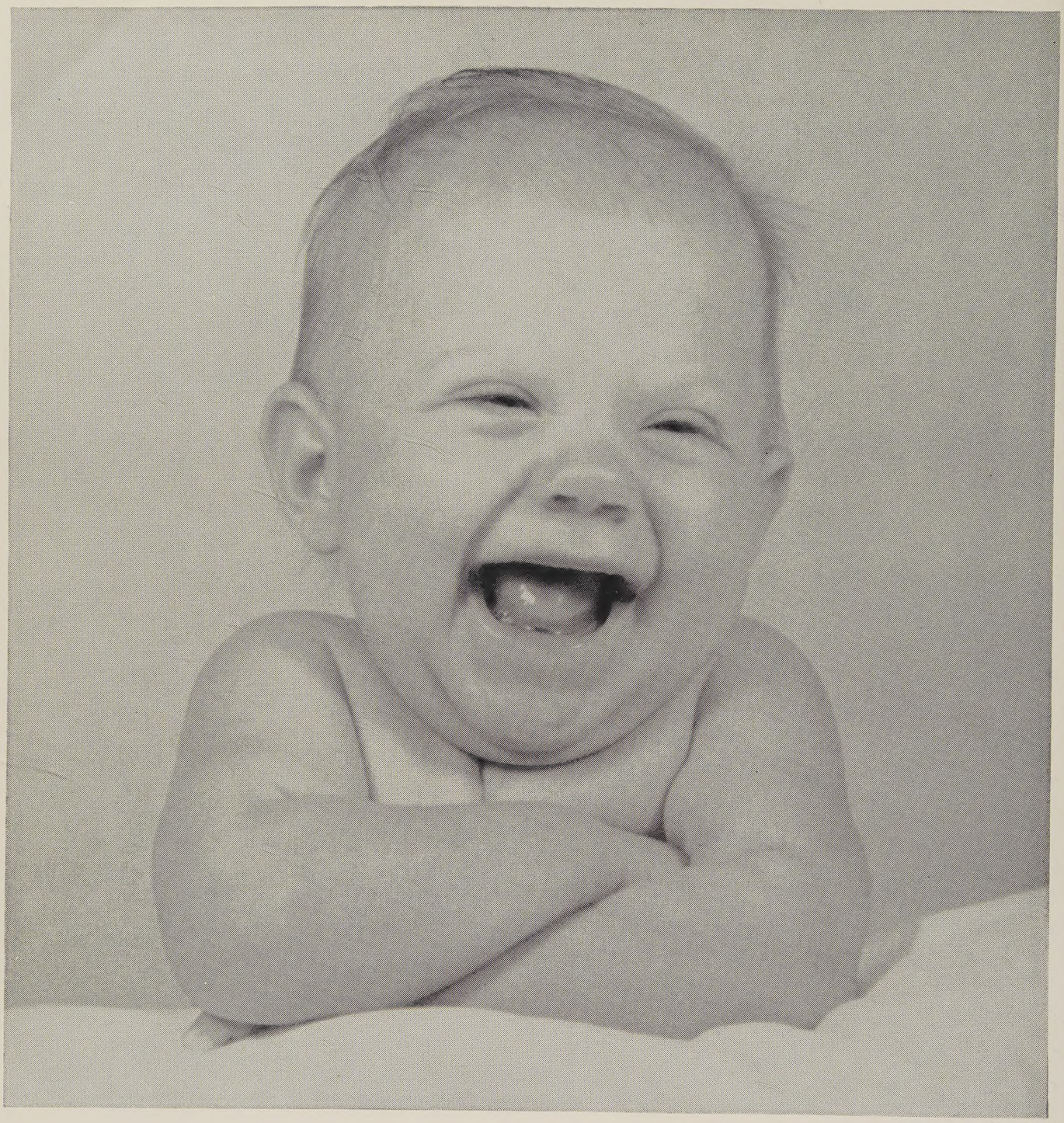

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THE ILLINOIS TECHNOGRAPH

Volume 74, Number 7 **April, 1959**

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As Bob Stanek, the cover artist, has shown this is the Navy Pier issue. The Technograph has had a good sized staff at the Pier for some time now, but this is their first chance to put out an issue completely their own. The Pier, being a two year school, is a good training ground for Tech staff members. Many of our past editors have been from there. We hope that this special issue will become an annual event in the future.

WDP

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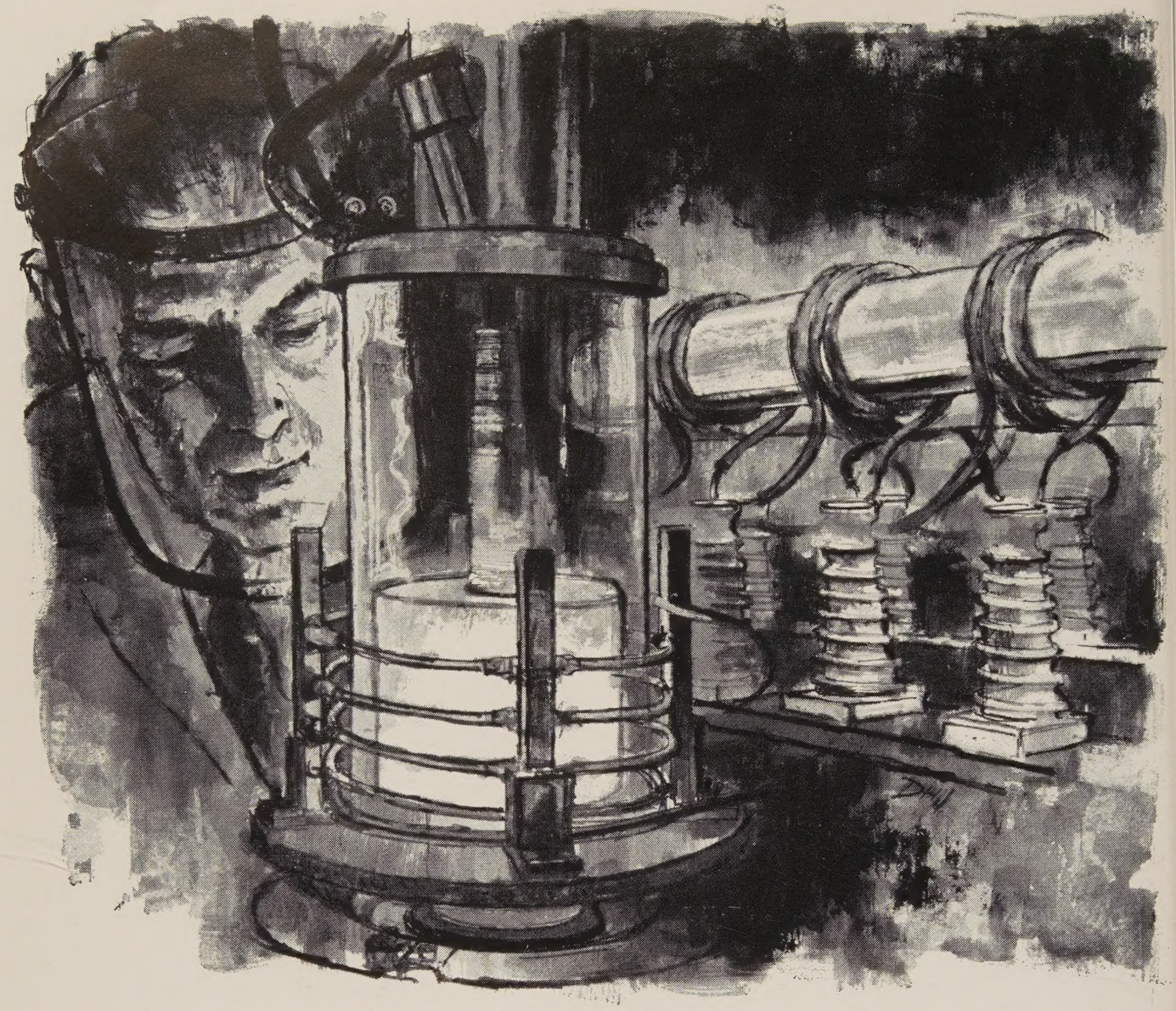

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THINGS TO THINK ABOUT

When planning your future—your life's work—you must carefully evaluate many factors. To help you, consider these facts about one of the world's major chemical companies, The Dow Chemical Company.

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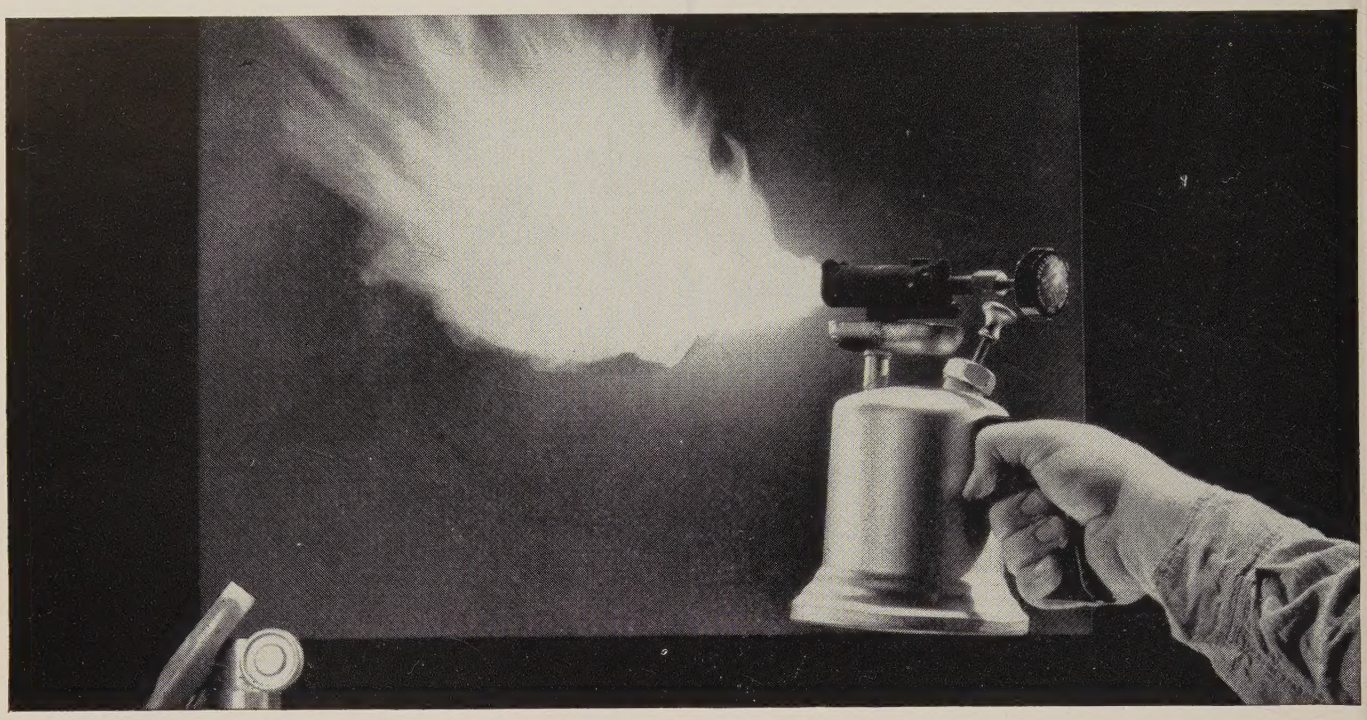
Why the new interest in flame retardance of plastic laminates?



Sheet of Synthane to which blowtorch is being applied

While it is unlikely you will ever take up your blowtorch to sample the flame resistance of laminated plastics, this property emerges as a lively topic for discussion among engineers.

Admittedly its import is for the councils of those whose equipment is flame-exposed or is powered, amplified or controlled by vacuum tubes and upon which, clustered or confined, you could properly fry an egg.

Under the circumstances, it is appropriate to ask what laminated plastics (or Synthane, to name our choice) have to offer in the way of flame retardance, and how this property relates to the other, and more widely used, advantages of laminates.

Two Specific Flame Retardant Laminates

There are two grades of Synthane laminates specifically earmarked for flame retardance—Grades FR-1 and FR-2. Except for its flame retardance, Grade FR-1 closely resembles standard paper base phenolic Grade XX Synthane. Grade FR-2 is similar to Grade FR-1, but may be readily hot punched and would be used where flame retardance with emphasis on punchability was desired.

Many Grades of Synthane Self Extinguishing

Many standard grades of laminates—though they contain no flame retardant additives—are self extinguishing. That is, they do not support combustion when the flame is removed.

For example, the fabric and glass melamine grades are excellent for their self-extinguishing characteristics. The same is true of the asbestos grades. Why, then, special flame retarding grades? The answer is partly financial.

The flame retardant grades FR-1 and FR-2 offer good electrical and mechanical properties (similar to Grade XX) plus excellent flame retardance and at a moderate cost. When the electrical or mechanical requirements are severe it is they that may control the choice of laminate even though flame retardance is still necessary. And it just so happens that the cost of producing grades with superior electrical and mechanical properties tops the cost of producing flame-retardant Grades FR-1 and FR-2.

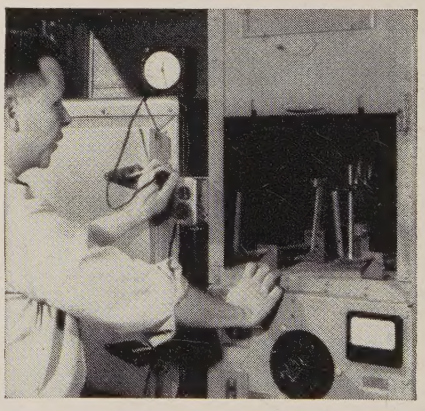
Comparison of Properties of Synthane Laminates with Relation to Flame Retardance

	GRADES										
Property	FR-1	FR-2	XX	C	L	C-M	L-M	G-5	G-8	A-M	AA-M
Flame Retardance	E	E	P	P	P	E	E	E	E	E	E
Heat Resistance	F	F	P	P	P	G	G	E	E	E	E
ARC Resistance	P	P	P	P	P	E	E	E	E	E	E
Mechanical Strength	F	F	F	G	G	G	G	E	E	G	G
Dimensional Stability	F	F	F	F	F	G	G	E	E	E	E
Moisture Resistance	E	E	G	G	G	G	G	E	E	E	E
Dielectric Strength	E	E	G	F	F	F	F	E	E	F	F
Machinability	E	E	E	E	E	E	E	F	F	F	F
Cost	Lowest	Low	Lowest	Low	Mod	Mod	Higher	Higher	Mod	Lowest	Higher

E = Excellent, G = Good, F = Fair, P = Poor

Obviously there is more to this business of selecting an electrical insulation than flame retardance. In any spot where flame retardance is a factor it is prudent to counsel with us, directly or through our representatives, to secure for yourself the Synthane Grade which supplies *all* of the properties you need *in combination* and at a reasonable cost. Our aim is to help you obtain the most for your money so that you may find coming to us a profitable habit.

For further information about Synthane standard or flame retardant grades write Synthane Corporation, 13 River Road, Oaks, Pa.



Flame retardant test on Synthane for switchgear application. Heat is supplied by coil encircling the sample. Temperatures up to 1600°-1800°F are measured with optical pyrometer.

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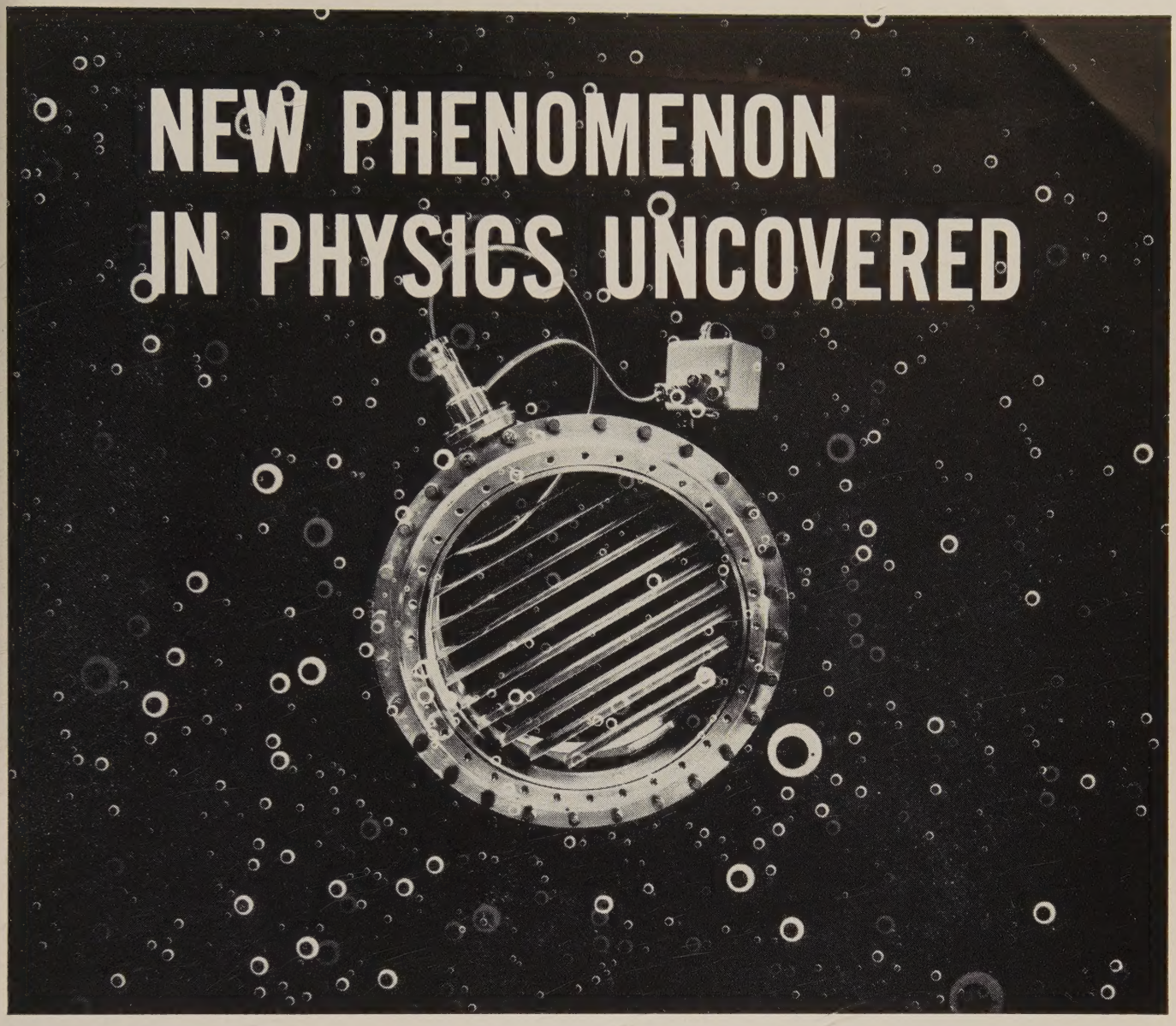

Investigation in detecting cavitation, or forming of vapor bubbles in liquid flow, led AiResearch engineers to the discovery of an important new phenomenon . . . *that flow of bubbles in liquids generates a magnetic field.* This discovery, among other things, helps solve critical flow problems in missile and industrial fields. The AiResearch cavitation detector pictured picks up these tell-tale signals as the liquid passes through the grid, pinpointing the cause of trouble.

Many such pioneering developments are underway in challenging, important work at AiResearch in missile, electronic, nuclear, aircraft and industrial fields.

Specific opportunities exist in system electronics and servo control units; computers and flight instruments; missile auxiliary power units; gas turbine engines, turbine and air motors; cryogenic and nuclear systems; pneumatic valves; industrial turbochargers; air conditioning and pressurization; and heat transfer, including electronic cooling.

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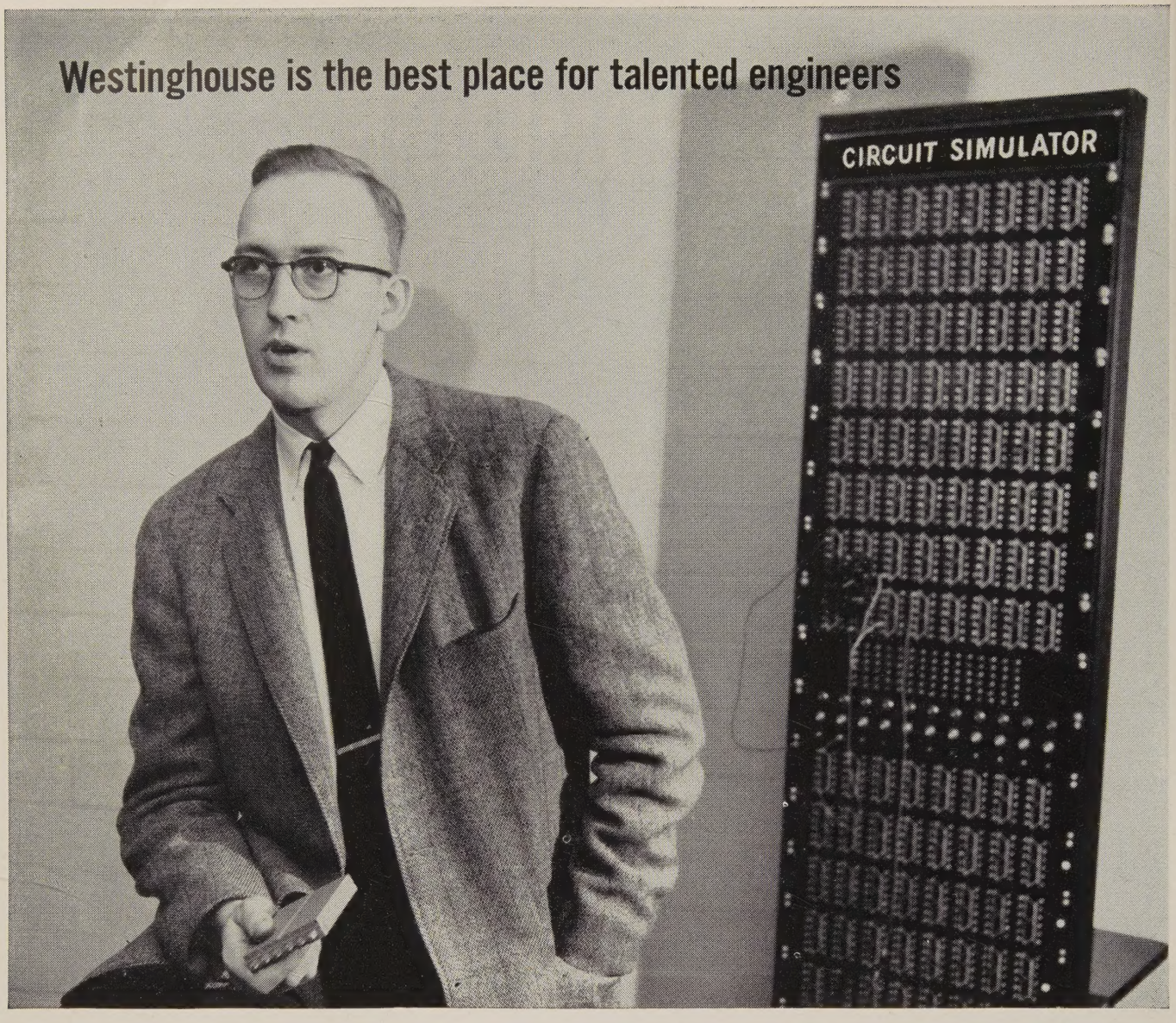

Frank Willard joined Westinghouse in 1954—now designing punched card control systems

At 28, Frank G. Willard, a 1953 BA and MSEE graduate of Dartmouth College, is already one of very few experts in an entirely new area in electrical engineering. Now a development engineer in the Westinghouse Control Division at Buffalo, N. Y., Frank is specializing in advanced industrial control systems. He helped to develop PRODAC* control, the first programmed digital automatic control system for heavy industry; he was responsible for the first industrial application of computor-type magnetic core information storage; and, through major creative work in logic circuits, he was a key man in the team which designed the first completely automatic blooming mill control system for the steel industry.

Most important, *Frank Willard is doing exactly what he wants to be doing.* Upon completion of the Westinghouse Student Training Course, he was assigned to the Control Division and, soon thereafter, was selected to attend the Westinghouse Advanced Design Course at the University of Pittsburgh. He has submitted 12 patent disclosures; and he has 8 U. S. patents pending.

Frank Willard is one of many talented young engineers who are finding rewarding careers with Westinghouse. You can, too, if you've got ambition and you're a man of exceptional ability. Our broad product line and decentralized operations provide a diversity of challenging opportunities for talented engineers. Guided missile controls, atomic power, automation, radar, semiconductors, and large power equipment are only a few of the fascinating career fields to be found at Westinghouse.

Why not find out now about the opportunities for *you* at Westinghouse? Write to Mr. L. H. Noggle, Westinghouse Educational Department, Ardmore & Brinton Roads, Pittsburgh 21, Pennsylvania.

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Lucretius...on discovering truth

"...no fact is so simple that it is not harder to believe than to doubt at the first presentation. Equally, there is nothing so mighty or so marvellous that the wonder it evokes does not tend to diminish in time. Take first the pure and undimmed lustre of the sky and all that it enshrines: the stars that roam across its surface, the moon and the surpassing splendor of the sunlight. If all these sights were now displayed to mortal view for the first time by a swift unforeseen revelation, what miracle could be recounted greater than this? What would men before the revelation have been less prone to conceive as possible? Nothing, surely. So marvellous would have been that sight—a sight which no one now, you will admit, thinks worthy of an upward glance into the luminous regions of the sky. So has satiety blunted the appetite of our eyes. Desist, therefore, from thrusting out reasoning from your mind because of its disconcerting novelty. Weigh it, rather, with discerning judgment. Then, if it seems to you true, give in. If it is false, gird yourself to oppose it."

—Lucretius, 1st Century B.C.

THE RAND CORPORATION, SANTA MONICA, CALIFORNIA

A nonprofit organization engaged in research on problems related to national security and the public interest

The Pier Speaks...

Loyalty or fight are words often used to connote school spirit. It is evidenced in the students' attitude toward attaining academic excellence and in their participation in extra-curricular activities. In these respects the students of the Chicago Undergraduate Division of the University of Illinois in its temporary quarters at Navy Pier have a school spirit on par with that of any university.

But loyalty and fight are more closely connected with another type of spirit. An intangible kind. It is contained in the pride that students feel in being a part of an academic institution, and in their desire to see it progress. Here at Navy Pier, this spirit was best shown in the students' persistent demands to have a permanent branch built to accommodate the future need of Chicago's college youth.

Yet many have claimed that the students at Navy Pier were lacking in this type of spirit. Too many had pegged the students as apathetic. Outsiders spoke of only a few students who had an interest in the Pier's future, particularly in regards to obtaining a permanent school site in the Chicago area.

We find the contrary to be true. How many citizens had written to their legislator or newspapers on the issue? How many businessmen or neighbors had banded together to situate this university in their area? How many political figures had voted for their children's future? How many of them took notice of the Pier's plight . . . until . . . last April 6th, when hundreds of our "apathetic" students marched down to Chicago's Loop to seek the help of Mayor Richard J. Daley in speeding the selection of a permanent site.

Since the Pier's formative years through the efforts of students, petitions had been signed; editorials had been written; public meetings held—all with the expressed desire of impressing the citizens of our State of the importance of obtaining a permanent Chicago site for our University.

If this isn't a proof of school spirit, what is?

The students have always recognized a need for a permanent site for the University of Illinois in Chicago. It has been the apathetic citizens of Illinois, and particularly Chicago, who had to be awakened to realize this vital academic need for the future of their children.

It has been the same old story. When the public wants action, it gets it. The difficulty has been to make them realize the need for action. The students of this university deserve credit for their part in impressing the public with the importance of developing a permanent site for our university. They have consistently prodded the lethargic public with a sharp and demanding needle.

At long last, results appear forthcoming. The acquisition of a site and the construction of a permanent University of Illinois in Chicago are now at least foreseeable.

And when the permanent U. of I. is built our hats will go off to all the students, old and new alike, from Navy Pier. They will have deserved a vote of thanks from all the citizens of Illinois for their persistent effort to bring the issue to the public eye.

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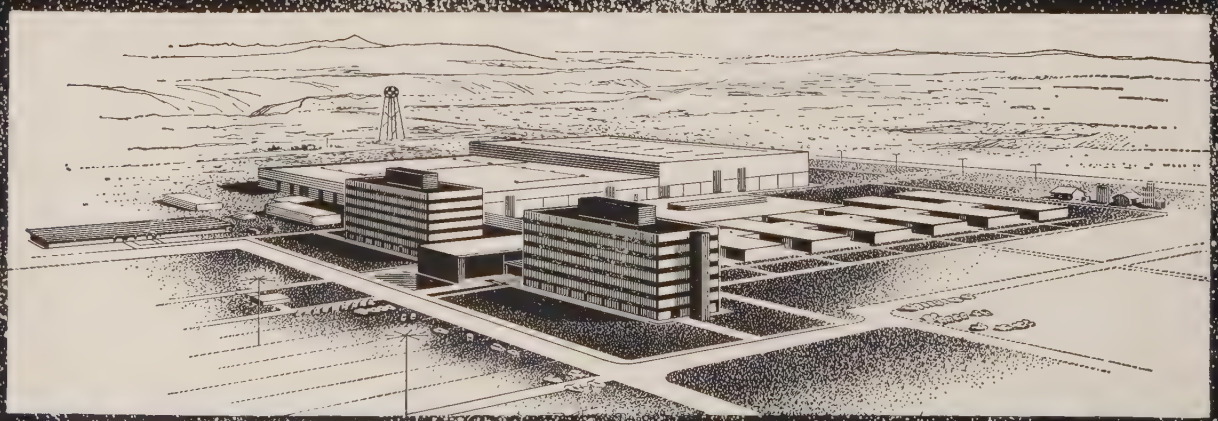

THE COLLEGE AND IT'S DEAN

At the Chicago Undergraduate Division the first two years are offered in the fields of aeronautical engineering, ceramic engineering, civil engineering, electrical engineering, general engineering, engineering physics, industrial engineering, mechanical engineering, metallurgical engineering, mining engineering, theoretical and applied mechanics and the combined liberal arts-engineering curriculum. Instruction is designed primarily to prepare the student to enter the College of Engineering on the Urbana campus of the University of Illinois to complete the courses leading to the degree.

There are over 1400 engineering students at UIC and 55 faculty members. In charge of all engineering faculty and students is Associate Dean Frederic W. Trezise. The dean was born in Ironwood, Michigan, and received a B. S. from Michigan State University in 1916; C. E. 1928; University of Wisconsin M. S. 1934; married Cora Jane Arthur; 2 children; Frederic W., Duxbury, Mass.; Mary Elizabeth (Mrs. L. G. Hernecheck), Champaign, Illinois.

His activities in education and industry are numerous. Included in these are the following: Member faculty Lawrence College 1920-1942, Professor Engineering 1934-42; Consulting Engineer—surveys, city planning, architectural superintendance, geological and mining, western U. S. and Mexico, hydrographic, hydrologic and geologic surveys, Manitoba; Hudson Bay and Arctic 1923-40; Hydraulic Engineer, Tennessee Valley Authority, 1936-42; personnel Officer TVA, Knoxville, Tenn., 2942-46; Chem. Eng. Sciences Division U. of Illinois 1947-49; Assoc. Dean Engineering, Chicago Division 1949 to date,

Author: Hydrology Lakes Michigan and Huron (1934), Synoptic Chart Historical and Economic Geology (1948). Contributed numerous articles to profession journals and periodicals.

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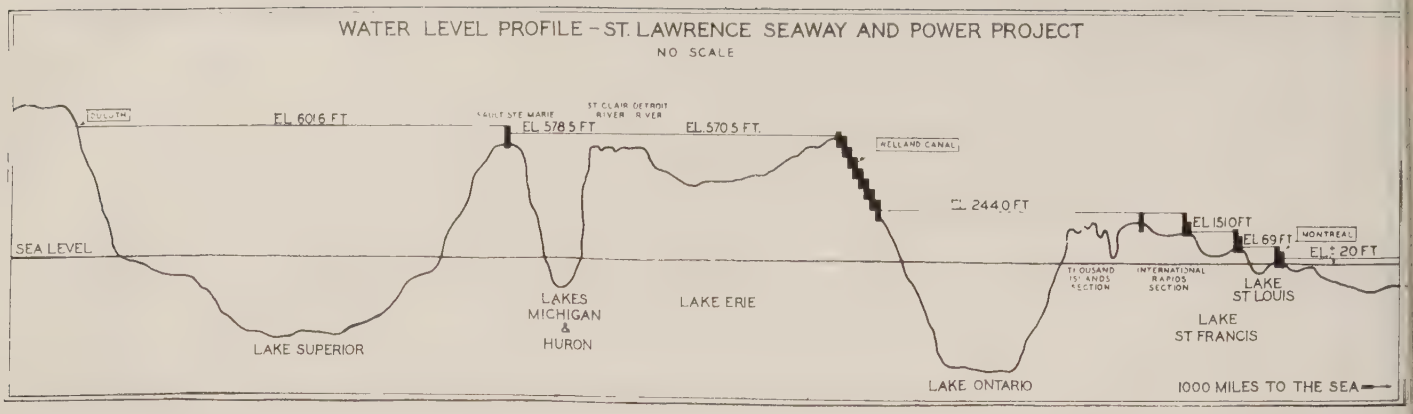


The St. Lawrence Seaway

By Irwin E. Tuckman, Arvydas Tamulis and Oliver Doe

The Saint Lawrence Seaway has been described as "the world's greatest inland navigation system." It extends from the Atlantic Ocean to the western end of Lake Superior, rises to about 602 feet, and is approximately 2,000 miles long from the sea to Duluth.

From the foot of Lake Ontario to Duluth, the sailing distance is 1,162 miles and to Chicago, 1,061 miles, by way of the five Great Lakes and their connecting channels. Generally speaking, the main bodies of the Great Lakes have ample depth for all classes of navigation, but the connecting waterways in their original condition presented more or less complete barriers to the passage of vessels. The connecting channels are Niagara River containing Niagara Falls and the Whirlpool Rapids between Lakes Ontario and Erie (Welland Canal used for navigation); the Detroit River, Lake St. Clair, and St. Clair River between Lakes Erie and Huron; the St. Mary's River with the locks at Sault Ste. Marie, between Lakes Huron, Michigan, and Superior; and the Straits of Mackinac between Lakes Huron and Michigan.

In general, the channels are limited to 25 feet in the downbound and two-way lanes, and 21 feet in the upbound, and the principal construction which would be required to deepen to 27 feet would occur between Lakes Erie and Huron in the Detroit and St. Clair Rivers, and the Detroit area, and at The Sault and also in the Straits of Mackinac to give access to Lakes Superior and Michigan.

The mighty Saint Lawrence Seaway had its humble beginning in Canada. The first attempt to build a canal was made by the Sulpicians in the early part of the 18th century. This was to bypass the Lachine Rapids, but due to a lack of funds it was never completed. Then in 1779, almost 80 years later, the first successful project, a series of locks and canals with a total rise of barely two feet between Lake St. Louis and Lake St. Francis was begun. It was completed in 1783.

In 1821 the Lachine Canal was started. This canal overcame a drop of 46 feet between Lake St. Louis and the Harbor of Montreal. It contained seven locks of five foot draft each, and was completed in 1825.

Some time during the building of the Lachine Canal a small private company started on the building of the Welland Canal to provide 8 foot navigation between Lake Ontario and Lake Erie. This was quite a large task considering that the Niagara escarpment is some 327 feet high. But despite difficulties, first canal was completed from lake to lake in 1833.

Since then Canada has been continually improving the waterways. From 1834 to 1856 the canals of the Saint Lawrence River were deepened to provide nine foot navigation and the Welland Canal was made larger to increase its capacity. And from 1863 to 1904 the canals were deepened to 14 feet.

Then in 1913 the building of the Welland Ship Canal was started. This canal is one of Canada's greatest engineering projects, forming a navigable waterway between Lake Erie and Lake Ontario. The Welland Ship Canal replaced the original 27 locks and consists of only eight, three of which are doubled. The locks have 30 feet of water over the sills and the canal is 27 feet deep, except for a few spots where it is only 25 feet. The canal is 27 miles long. It is 200 feet wide at the bottom, and 310 feet wide at the surface line. The eight locks raise ships 326 feet from Lake Ontario to Lake Erie.

The project cost Canada $132,000,000 by the time it was completed in 1932.

A ship traveling from the sea to Duluth climbs five steps, and passes many new sights which have been added to the scenery along with the Seaway.

The first step of the journey is 20 foot rise from the sea to the Port of Montreal. The ships will travel from the Gulf of the St. Lawrence along the St. Lawrence River, past Quebec, to a point about 30 miles below Quebec. Here they enter the St. Lawrence Ship Channel. It was originally about 10½ feet deep, but over the years successive Canadian governments have deepened it to 35 feet. The channel's width varies from 450 to 800 feet, depending on the area needed for the navigation to Montreal.

The construction of the Seaway channel along the south shore of the St. Lawrence River, directly opposite the city of Montreal, includes many changes and modifications to the foundations, superstructure, and southern approaches

to the Jacques Cartier Bridge. At the point where the Seaway channel and the bridge intersect it is necessary to provide 120 feet of clearance between the bridge and high water level. The original clearance of 40 feet between the lower chord of the original deck truss span and high water level will be increased in two main steps.

First the original deck truss span will be replaced by a through truss span. This will be accomplished by first building the new through truss bridge span on a false work beside the original span, and then replacing the new for the old span. This entire operation will interrupt traffic only about 4 to 6 hours and will add 30 more feet of clearance.

The remaining 50 feet will be obtained by jacking the bridge structure and then extending the supporting piers straight up. This second step will be performed in stages so as not to interrupt the flow of traffic over the bridge. The adjoining bridge spans will be raised in successive amounts to produce a gradual maximum grade of 4.2%.

The Southern approaches to the Jacques Cartier Bridge are to have a new roadway system, grade separations, and a new plaza and toll booths. During the construction of these projects temporary Bailey bridges and access roads will be installed to divert traffic for about one year. Material excavated from the Seaway channel will be used to fill the embankments for the new traffic circle and plaza.

A little further down the river is the Victoria Bridge, a railway-highway bridge owned and operated by the Canadian National Railway. Since it is a low level bridge over which both motor vehicles and trains traverse it is impossible to elevate the bridge at reasonable cost. With the aid of canal dykes, embankments, and two lift spans, one at Victoria Bridge and the other at the upper end of St. Lambert Lock the highway traffic can use either span while a ship is passing under the other. A system of traffic lights will control the use of the spans and therefore maintain a continuous flow of traffic over the river.

The first lock of the Saint Lawrence Seaway is the Saint Lambert lock. It will raise or lower ships over the 15 foot difference between Montreal Harbor and the level of the Laprairie basin. The St. Lambert is 768 feet long and 80 feet wide, as are all the locks. Over 1,000 cubic yards of concrete for the construction of the lock are produced daily by the plant located near its future site.

A new bridge within sight of the Saint Lambert for highway traffic is being built. This new bridge will span the river at Nuns Island and is sometimes referred to as "Nuns" Island Bridge, although the official name is the National Harbours Board Bridge.

After a ship leaves the St. Lambert lock it will enter the Laprairie Basin Channel. This channel is nine miles long, running around the basin from St. Lambert Lock to Cote St. Catherine lock. It is protected by a high dyke and contains two turning basins for ships. The area adjacent to the channel has high industrial potential.

The second big step of the seaway is the St. Lawrence River above Montreal which includes Lachine, Soulanges, Lake St. Francis, International Rapids, and the Thousand Islands section.

Approaching the Lachine Area we come to the Cote St. Catherine lock. It will raise and lower ships 30 feet between the Laprairie Basin and the overland channel which extends from the lock to Lake St. Louis further upstream.

The Honor Mercier Bridge which crossed the St. Lawrence above the Lachine Rapids will undergo a few changes. When it is reconstructed it will have a complete new southern approach with 26 foot wide modern divided highways and grade separations. The improvement will eliminate the present bottleneck where traffic now passes under the Canadian Pacific Railway in a narrow viaduct.

A little further on is the Canadian Pacific Railway Caughnawaga Bridge. Lift spans must be installed in the approach to this bridge to give clearance for ships.

From here the ship passes through Lake St. Louis to the Soulanges Section. The Beauharnois Power House dam is located at the foot of the B. P. Canal run by Hydro Quebec. The full potential of the powerhouse is 2,000,000 horsepower.

To the west of the power house at Beauharnois, at the upper end of the Lake St. Louis two locks are being constructed. These locks each with a 42 foot lift, will raise ships from Lake St. Louis to the Beauharnois Power canal. At Lower Beauharnois lock a cofferdam was built to permit excavation on dry land. An aggregate plant was erected at Melocheville to produce 3", 1½", and ¾" aggregate as well as sand required for the concrete to be placed in both the Upper and Lower Beaucharnois locks. When a ship leaves Upper Beauharnois it travels along the 16 mile Beauharnois Power Canal to Lake St. Francis.

In Lake St. Francis fleets of dredges are at work to provide a Seaway channel 27 feet deep. The dredges scoop earth from the lake floor with their ten ton buckets and dump it in scows alongside. These are towed to areas clear of the channel and dumped.

From Lake St. Francis, ships will leave the route of the old canal and will pass to the south of Cornwall Island. As the ships go south they will move into American territory where the present N. Y. Central R. R. bridge must

(Continued on Page 35)

The Iroquois Lock, the most westerly of seven new locks being built for the St. Lawrence Seaway received its final test, November 22, 1957, as the Canadian Government Ship Grenville was raised and lowered in the lock chamber. This lock will provide access between the power pool (in the International Rapids Section of the Seaway) and the Thousand Islands Section of the St. Lawrence River, leading west to Lake Ontario. (Photo courtesy of The St. Lawrence Seaway Authority)

FIVE YEAR

CAPITOL IMPROVEMENTS

PROGRAM

CITY of CHICAGO

1958 - 1962

Edited by

KARL SCHWARTZ

At the request of Mayor Richard J. Daley, the Department of City Planning has analzed proposals which would benefit every neighborhood in the city of Chicago. The Capital Improvements Program Committee was formed and made a review of situations which needed corrections or improvements. They submitted a report which proposed the expenditure of $852.924,000 over a five year period from 1958 to 1962. The plan covers streets and highways, transit, airports, rivers and harbors, parks and recreation, water works, sewers, public buildings, parking facilities, and capital improvement programs of other public agencies.

In order to analyze such situations completely, the committee considered the following:

1. Is the project needed for the convenience, health, and safety of the general public?

2. Is the project of social, cultural, economic and aesthetic benefit to the City of Chicago?

3. Does the project contribute to the conservation of the area within which it is located?

4. Is the improvement in conformity with plans of the Department of City Planning?

5. Is the project coordinated with other projects proposed by City Departments and other public and private agencies?

6. Can the improvement be financed from funds now available and from funds which can be expected to become available during the program period?

7. Is the additional financing needed to carry out this program within the limits of a reasonable municipal debt which can be paid with an orderly system of debt retirement?

This type of analyzation of all Capital Improvement Projects insured the people of Chicago a beneficial and economical schedule of capital projects construction.

The Capital Improvements Program staff is now in the process of consolidating and systemizing all such information which has been used in developing the program contained in this report. Such a procedure permits even better city wide programming and, in addition, will pave the way for ultimate overall programming of capital work in cooperation with other agencies within the city.

STREETS AND HIGHWAYS

A $360,122,000 program is planned for trafficway improvements

An estimated $58,944,000 will be spent to improve streets in the Preferential Street System.

$29,755,000 will be spent to provide new or modernized street lighting on preferential streets. $24,000,000 will be spent to improve street lighting in residential areas.

$170,000,000 will be spent for expressway construction in the City of Chicago.

$25,000,00 was spent for the completion of the Calumet Skyway Toll Bridge.

$42,980,000 will be spent for construction or reconstruction of bridges, viaducts and grade separations.

$9,443,000 will be spent for the installation of new traffic signals and the modernization of traffic signals.

TRANSIT

$95,800,000 will be spent for the construction of rapid transit facilities in the median strips of expressways.

AIRPORTS

$117,015,000 will be spent for construction of additional facilities at the city's Airports.

RIVERS AND HARBORS

A $7,680,000 will be spent for construction and reconstruction of dock facilities, and river and harber improvements.

PARKS AND RECREATION

A $6,000,000 program is planned for improvements and additions to Chicago's recreational facilities.

WATERWORKS

A $154,592,000 program is planned for water works improvements: $112,858,000 will be spent for construction of pumping stations, filtration plans and tunnels; $41,734,000 will be spent for water main extensions.

SEWERS

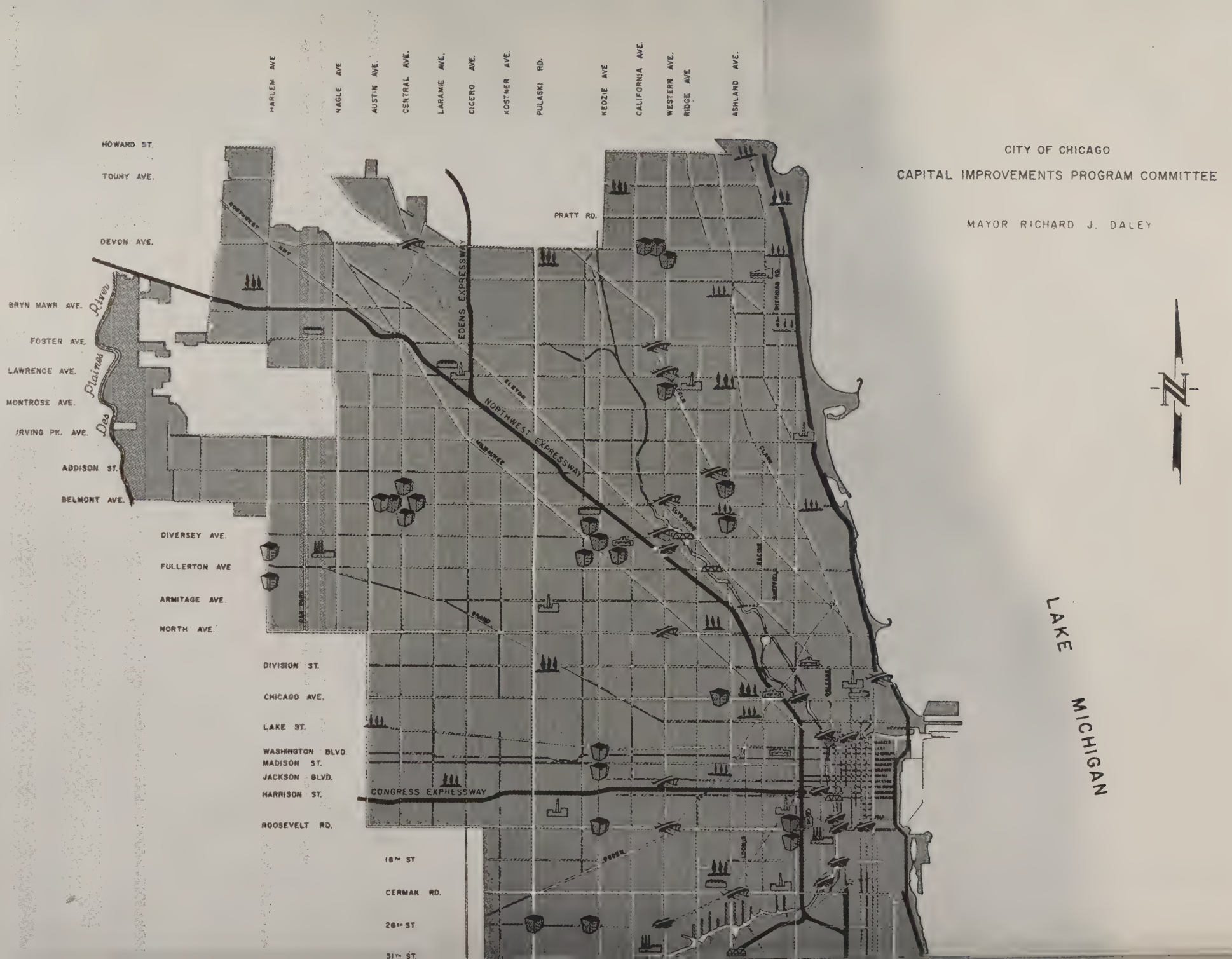
$64,340,000 will be spent to construct and reconstruct sewers in City of Chicago.

PUBLIC BUILDINGS

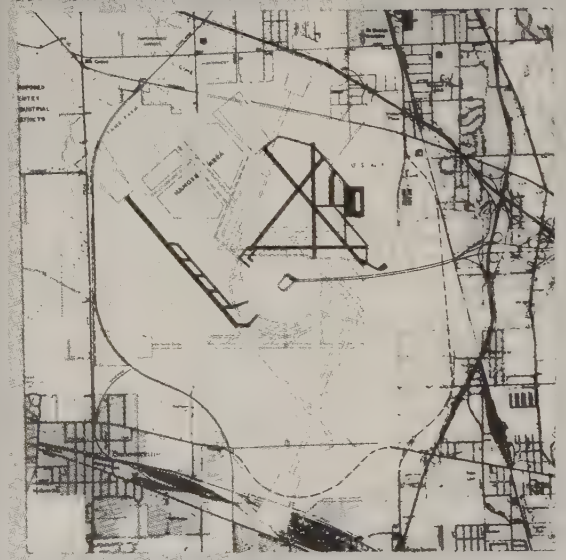
The five year program for the construction and reconstruction of public buildings will require the expenditure of $34,864,000.

PARKING FACILITIES

A $12,511,000 program is planned for construction of city parking facilities.


CITY OF CHICAGO
CAPITAL IMPROVEMENTS PROGRAM COMMITTEE
MAYOR RICHARD J. DALEY
HARLEM AVE
NAGLE AVE
AUSTIN AVE.
CENTRAL AVE.
LARAMIE AVE.
CICERO AVE.
KOSTNER AVE.
PULASKI RD.
KEDZIE AVE
CALIFORNIA AVE.
WESTERN AVE.
RIDGE AVE
ASHLAND AVE.
HOWARD ST.
TOUHY AVE.
DEVON AVE.
BRYN MAWR AVE.
FOSTER AVE.
LAWRENCE AVE.
MONTROSE AVE.
IRVING PK. AVE.
ADDISON ST.
BELMONT AVE.
DIVERSEY AVE.
FULLERTON AVE
ARMITAGE AVE.
NORTH AVE.
DIVISION ST.
CHICAGO AVE.
LAKE ST.
WASHINGTON BLVD.
MADISON ST.
JACKSON BLVD.
HARRISON ST.
ROOSEVELT RD.
18TH ST
CERMAK RD.
26TH ST
31ST ST
Des Plaines River
EDENS EXPRESSWAY
NORTHWEST EXPRESSWAY
CONGRESS EXPRESSWAY
PRATT RD.
LAKE MICHIGAN

NOTE: STREET LIGHTING PROJECTS, TRAFFIC SIGNAL PROJECTS, SEWER PROJECTS, WATER MAIN PROJECTS, PROPOSED TRANSIT FACILITIES, AND PROPOSED BASKETBALL COURTS HAVE NOT BEEN ILLUSTRATED. PLEASE NOTE THE PROJECT LISTINGS WHICH FOLLOW FOR THE LOCATIONS OF THESE ITEMS.



O'HARE FIELD
CHICAGO INTERNATIONAL AIRPORT

43rd ST.
47th ST.
51st ST.
55th ST.
59th ST.
63rd ST.
MARQUETTE RD.
71st ST.
75th ST.
79th ST.
83rd ST.
87th ST.
95th ST.
103rd ST.
107th ST.
111th ST.
115th ST.
119th ST.
127th ST.
130th ST.

SOUTH EXPRESSWAY
CALUMET SKYWAY TOLL BRIDGE
CALUMET HARBOR

PULASKI RD.
KEDZIE AVE.
WESTERN AVE.
ASHLAND AVE.
HALSTED ST.
STATE ST.
INDIANA AVE.
COTTAGE GROVE AVE.
STONY ISLAND AVE.
YATES AVE.
TORRENCE AVE.
COMMERCIAL AVE.
AVENUE O

SCALE

FIXED BRIDGE
BRIDGE, VIADUCT AND OVERPASS
GRADE SEPARATION
PARKS AND RECREATION
POLICE BUILDING
AIRPORT
INCINERATOR
WARD OFFICE
FIRE BUILDING
PUMPING STATION
POLICE & FIRE ACADEMY
LIBRARY
PARKING FACILITIES

Chicago Exposition Center

By Mike Murphy

Chicago's lakefront at 23rd Street is taking on a new look. This new look is the construction of an impressive exhibition center. During January of this year the actual construction on this massive structure was started. Since January much progress has been made toward the completion which is expected to occur in November, 1960.

This $34,500,000 building will be used as a center for conventions and exhibitions of all types. Political and business conventions will become a familiar affair at this location. Not only conventions but also exhibitions such as art and hobby shows will be seen regularly.

The building, which was for many years in the planning stage, was designed by Alfred Shaw who was assisted by John Root and Edward Stone. The engineering consultant was Victor Hofer of the firm of Ralph H. Burke.

The structure rests on H-beam steel pilings which go down to bedrock. The building is 1,100 feet long and 330 feet wide. The roof is supported by 210 foot spans which have 60 foot cantilever extensions at each end.

The structure contains two main levels. They are known as the +20 and +42 levels because of their respective elevations. The +20 level will contain meeting rooms of various sizes and capacities. Also included at this level will be the center's own fire department, police department, first aid station, and various other service facilities. On this floor there will be a gallery for exhibition of hobbies and arts. There will be a public restaurant, public cafeteria ,and various service shops such as a drug store. A transportation service will also be provided for railroad and airline tickets. An area for storage of crates and a communication center are also planned for this floor.

The 42 level will be commonly known as the exhibition level. This floor will contain 300,000 feet of open area to be used for exhibition purposes. This floor will contain the entrances to the 5,000 seat theater-type auditorium; the building itself will contain a smaller 500 seat theater.

A lower level known as the +6 level has been excavated but will not be fully developed until a later date. This level, however, will contain the stage of the huge auditorium. The lower level may also contain an underground garage which will hold between 500 and 600 cars.

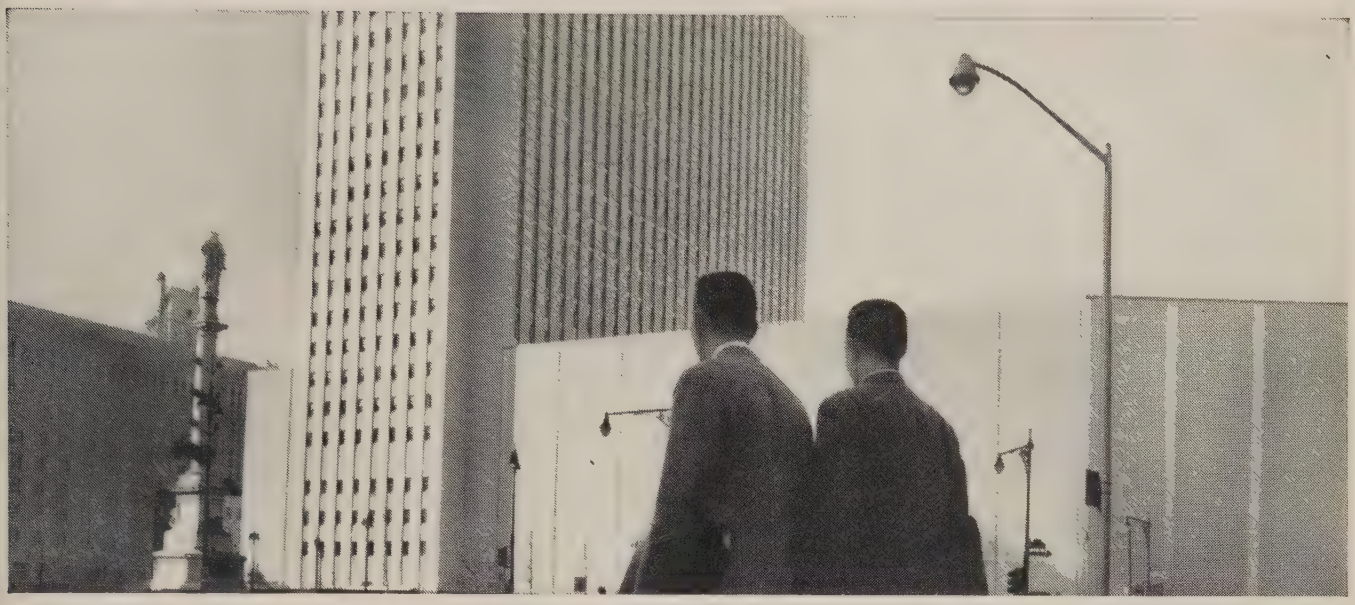
Some of the unique features of the building will be the trucking facilities which will include the convenience of trucks being able to drive right into the exhibition area. Trucks which are servicing the theater or the kitchens will use and undercover entrance so that they will not interfere with other loading or unloading operations. The Illinois Central Railroad will maintain a spur which will enter the lower level. This will make delivery of exhibitions by railroads possible. There also will be a direct drive under Lake Shore Drive from the building to Soldier Field.

The exterior walls of the building are of pre-cast concrete. These walls will be decorated with some of the original sculpture of Constantine Nivalo.

These are some of the features of what promises to be a beautiful landmark in a growing Chicago.

Lake Front Exposition Center—Main entrance 23rd Street approach.

New "post-grad" program helps engineers move ahead at Western Electric



MANHATTAN'S COLISEUM TOWER building houses Western Electric's New York training center. Here, as in Chicago and Winston-Salem, N.C., Western Electric engineers participate in a training program that closely resembles a university graduate school.

Careers get off to a fast start—and keep on growing—at Western Electric.

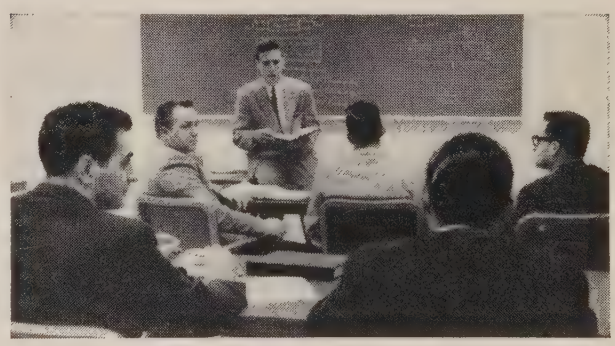
One big help is our new Graduate Engineering Training Program. This unique full-time, off-the-job study program starts soon after you join Western Electric . . . continues throughout your career. Students are offered courses in various fields including semiconductors, computers, feedback control systems, and problem solving techniques. What's more, they study methods for improving skills in communicating technical information and the art of getting ideas across.

You'll find the work at Western Electric stimulating, too. As manufacturing and supply unit of the Bell System, we pioneered in the production of the transistor, repeatered submarine cable, and the provision of microwave telephone and television facilities spanning the country. Engineering skills can't help developing—careers can't help prospering—in the lively, exciting technical climate at Western Electric.

Western Electric technical fields include mechanical, electrical, chemical, civil and industrial engineering, plus the physical sciences. For more information pick up a copy of "Consider a Career at Western Electric" from your Placement Officer. Or write College Relations, Room 200D, Western Electric Company, 195 Broadway, New York 7, N. Y. And sign up for a Western Electric interview when the Bell System Interviewing Team visits your campus.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM



CLASSROOM SESSION at one of the centers takes up the first part of the three-phase program, Introduction to Western Electric Engineering. During this initial nine-week training period, new engineers are provided with a better understanding of Western Electric engineering methods and technical practices.

TECHNICAL TALK often continues after class. The free and easy informality of the new Western Electric training program offers plenty of opportunity for the stimulating exchange of ideas.

Western Electric Graduate Engineering Training Centers located at Chicago, Winston-Salem, N. C., and New York. Principal manufacturing locations at Chicago, Ill.; Kearny, N. J.; Baltimore, Md.; Indianapolis, Ind.; Allentown and Laureldale, Pa.; Burlington, Greensboro and Winston-Salem, N. C.; Buffalo, N. Y.; North Andover, Mass.; Lincoln and Omaha, Neb.; Kansas City, Mo.; Columbus, Ohio; Oklahoma City, Okla.; Teletype Corporation, Chicago, Ill. and Little Rock, Ark. Also Western Electric Distribution Centers in 32 cities and installation headquarters in 16 cities. General headquarters: 195 Broadway, New York 7, New York.

some bridges must be crossed *before* you come to them

Clearly there *are* such bridges. You started to cross one of them when you tackled a college education. By electing an engineering course, you took additional steps. It's the bridge that takes you from education to profession.

Perhaps several companies on the "profession side" will beckon to you. Naturally, you'll try to choose the firmest and highest ground accessible to a beginner—ground that leads to more challenge, more responsibility and greater reward. Companies situated on the firmest and highest ground will be those whose products or services enjoy a lively and continuing demand.

As a leader in a broad and exciting field, Sikorsky Aircraft is just such a company. And as an organization with its eye on the future, each year Sikorsky has openings for young men who show promise of being able to make outstanding contributions to the development of direct-lift aircraft.

If you're almost across that education-to-career bridge, write for information about careers with the world's pioneer helicopter manufacturer. *Please address Mr. Richard L. Auten, Personnel Department.*

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A FOUNDRY IN MINIATURE

By Mike Murphy

A new and interesting addition was recently made to the Cast Metals Laboratory of the University of Illinois at Chicago. It is a working model of a modern day foundry.

The model, valued at $35,000, was donated to the University by the Whiting Corporation of Harvey, Illinois, manufacturers of equipment for use in foundries. The Whiting Corporation used the model at various shows sponsored by the American Foundrymen's Society.

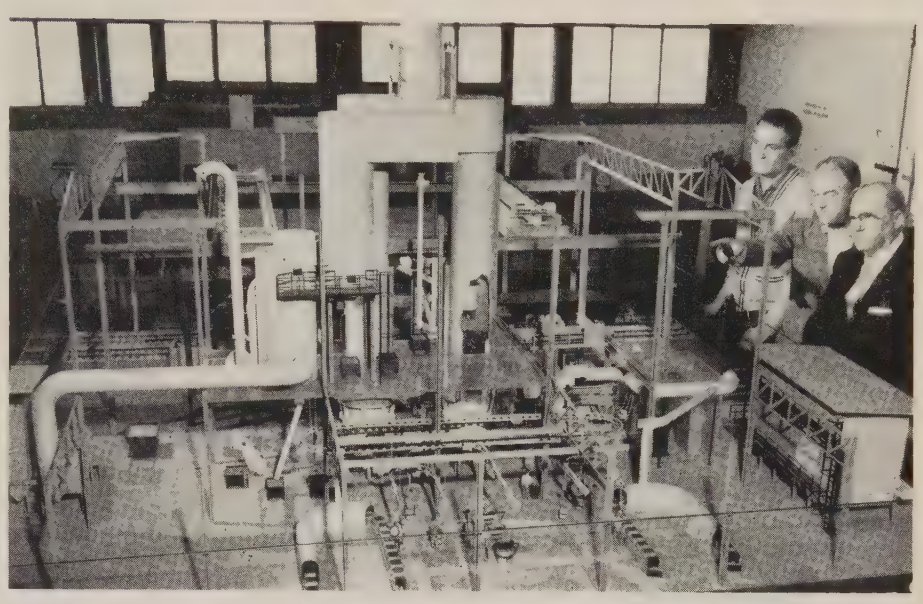
Roy W. Schroeder, Associate Professor of Foundry and Pattern Design, at Navy Pier was instrumental in obtaining the model for the school. The model was first shown in 1954 at the National Convention of the American Foundrymen's Society in Atlantic City, N. J. It was at this convention that Mr. Schroeder saw the model. He asked a friend at the convention, Robert Hammond, past chairman of the board of director of the Whiting Corporation, if the model could be donated to the school. Mr. Hammond referred Mr. Schroeder to Gordon Seavoy, vice president in charge of sales for Whiting Corporation. Mr. Seavoy placed the name of the school on a list of institutions which wanted the model.

The model, which was viewed by thousands of visitors to the various shows which Whiting Corporation took part in, is now being used to train foundry technicians.

The model occupies an area of about 64 sq. ft. It is built to a scale of ½"= 1'. Certain sections of the model operate showing how the metal is put into the furnaces, how the charges are made up and the installation of the hot blast system which enables the foundries to increase their melting efficiency by fifty per cent.

The model also shows the complete dust arrester system which traps the dust from burned gases by passing the gases through a series of fiber glass bags. This system of dust collection helps the foundries have better relations with the surrounding communities by reducing the possibility of air pollution.

Other objects shown in the model are the hot blast cupolas, iron trimming platform, "Hydro-Arc" electric furnace and all the other equipment common to the modern foundry.



—Photo courtesy "Pics Chicago"

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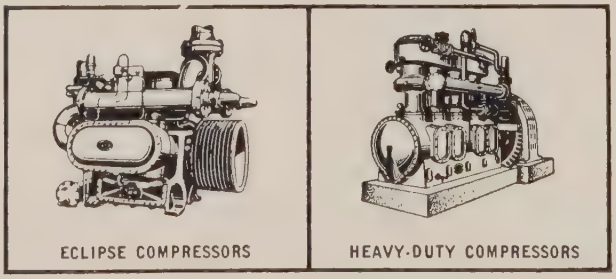

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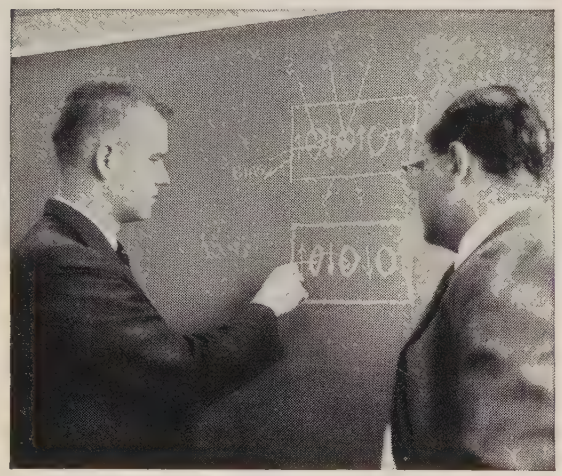
Product Development at IBM

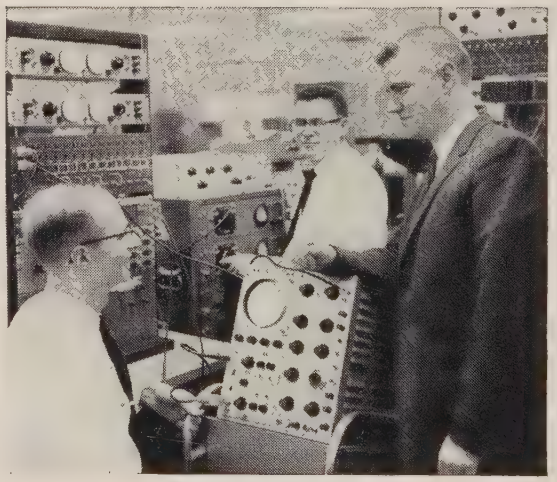
IBM Engineer Richard R. Booth explores electronic frontiers to develop new, faster and larger storage devices for tomorrow's computers.



Computing time cut from six months to one day

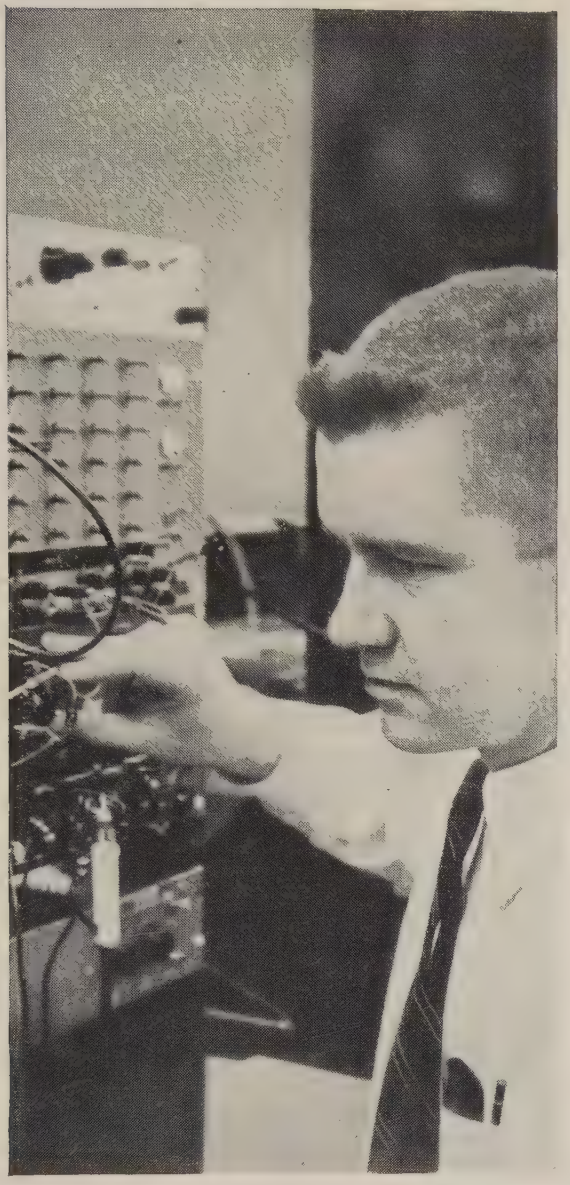
"My job is to design and develop new, high-speed storage devices for a powerful new computer that will perform, in one day, operations requiring six months on present equipment," said Dick Booth as he began a typical day recently. A product development engineer at the IBM Laboratories in Poughkeepsie, N. Y., he started his morning with a conference on a product of great interest to him: a magnetic core storage device with a nondestructive read-out feature. For an hour, he discussed with circuit design engineers the logical devices needed for the register—such as magnetic core drivers and sense amplifiers. Should such devices not be available, the group would work on designs for new ones.

Dick Booth next met with members of the Magnetic Materials Group to establish specifications for the magnetic core memory elements to be used in the register. He also discussed with the group the development of equipment to test the memory elements. "This magnetic core register is based on an original idea of mine," he explained. "When you have a worthwhile idea, you will be given a free hand in proving it out, backed by IBM's resources — plus the assistance of skilled specialists."



Increasing responsibility

At 10:30, Dick Booth reviewed the status of the entire project with the two engineers, two technicians, and one logic designer who make up his team. "My present position is staff engineer," he explained. "It's the second promotion I've had since I joined IBM three years ago with a B.S.E.E. degree from the University of Illinois. I know that there are plenty of other opportunities to move ahead. Furthermore, parallel advancement opportunities exist for engineers in either engineering development or engineering management."



Preparing for the future

In the afternoon, Dick Booth went to the 704 Computing Center to supervise some complex precision computations. "You see how quickly the 704 arrives at the answers," he said. "The computer being developed is expected to multiply more than 500,000 fourteen-digit numbers a second and add them at the rate of one million a second. The computer may be used for design computations for reactors, as well as calculations of satellite behavior. Of course it should have hundreds of other applications."

At 3:30 P.M., Dick Booth attended a weekly class on Theoretical Physics that lasted until 5:00. Afterward, he commented, "You know, IBM offers excellent educational opportunities both in general education and for advanced degrees. One of the engineers in my group has just received his Master's degree from Syracuse University, after completing a postgraduate program given right here at the IBM Laboratory."

A chance to contribute

As he was leaving for the evening, he said, "Yes, I'd recommend an IBM career to any college graduate who wants to exercise his creative ability. IBM will appreciate his talent and he'll have the opportunity to work with specialists who are tops in their fields. I doubt that he'd be able to find a more sympathetic and stimulating atmosphere. Furthermore, he'll have the added incentive of contributing to vitally important projects . . . projects that will take him to the frontiers of knowledge in computer electronics."

* * *

Talented college graduates will find exciting, rewarding careers at IBM. Excellent opportunities are now available in Research, Development, Manufacturing, Applied Science, Sales, and Administration. Find out from your College Placement Office when our interviewers will next visit your campus. Or, for information about careers of interest to you, write to:

Manager of Recruitment
IBM Corporation, Dept. 839
590 Madison Avenue, New York 22, N. Y.

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HAVE SEXTANT WILL TRAVEL

By Sheldon Altman

In the midst of a hectic exam week what poor, beleaguered student hasn't thrown his book against the wall and let his mind wander to thoughts of a free and easy life aboard a boat and a life for himself on a small island in the sun. Can you see what sails against the horizon and feel salt spray against your face, sans exams, sans homework, sans slide rule, sans everything. I have thought of sailing the ocean more than one time. Thinking is one thing and doing is another. We, at the Pier, have in our midst a young instructor that has sailed the Atlantic and Pacific oceans.

What is this man like, who has done what we dreamers only think about? He is an ordinary fellow, which seems to prove that anyone of us can do things we only dare think about. His resume for the 1959 Trans-Pacific Race, this summer, might look like the following:

NAVIGATOR
William J. Stanley

Experienced yachtsman desires berth as Navigator for 1959 Trans-Pacific Race.

Personal Data

Date of Birth: May 6, 1926.
Place of Birth: Chicago, Illinois.
Height: 5′ 11″.
Weight: 190 lbs.
Amateur Experience:
Physical Defects: None.
Health: Excellent.
Marital Status: Single.
Profession: Engineer.

Over ten years of experience on racing cruising boats, qualified as navigator, experienced at helm, in the cockpit, on the fore deck, and in galley.

Major Racing Events Participated In Recent Years

Trans-Atlantic Cruise 1959, New-Cannes, Schooner "Mystic," Navigator.

Miami-Nassau Race 1958, Cutter "Chace," Navigator.

Fasnet Race, England 1957, Yawl "Carina," Helmsman.

Trans-Atlantic race to Spain 1957, Yawl "Criollo," Ass't. Navigator.

Made six Mackinac races and sailed aboard such known Great Lake Yachts as — "Carice," "Freebooter," Kowloon," "Harlin," "Fleetwood," and "Quaiver."

A man just doesn't start sailing the oceans in racing yachts overnight. You might be interested in how this particular man became a navigator and yachtsman on his salary as an instructor.

It all started in Chicago when Stanley was living on our great South Side.

WILLIAM J. STANLEY

59th and Kedzie is the vicinity for you people who know the city. It seems that people raced model sail boats in the lagoon at 54th and the Drive. Mr. Stanley raced his model boats in this lagoon and this started his interest in the real thing. He started building dinghies in a boat shop in Gage Park. This budding yachting career was cut short by a hitch in the navy which started in 1944. His job was to repair decoding machines aboard the U. S. S. Whitney, a Destroyer Repair ship. This job became a bore so he took up deep-sea diving. His ship was the first to occupy Korea in 1946 and he did deep sea diving there and at Guam and Okinawau.

After the navy he came back to Chi in 1946. Sailing again became a major interest but he was limited to the small boats that sail the lake. Three years at Illinois made boating take another rest. His job after graduation took him to a company in Milwaukee where he go his chance at sailing on bigger boats. I was in Milwaukee that he made th six Mackinaw races before mentioned Courses in navigation and seamanshi with the U. S. Power Squadron gav him the knowledge he needed for thes big boats. With a few contacts in th east he had his first chance at ocea racing. With a leave of absence fro his company in Milwaukee he starte his master's degree and raced durin the summers and winter vacation While teaching in the machine shop la at the Pier he was able to race th summer '58 race aboard "Mystic" to th Riviera.

How do you secure a berth aboar an ocean-going yacht? The first thing to do is to locate the boats sailing. I you have been sailing as long as Bil Stanley you would know practically b instinct who is sailing. You would know the yacht clubs sponsoring and star your correspondence for berth about a year ahead of time. You would have to have a number of skills so that i the position you ask for doesn't come through you can secure another. Navigation, helm, cockpit, fore deck and even the galley must be familiar territory to you. You never see the crew until the day the race draws near. They are all corresponding with the skipper as you were.

Suppose you asked aboard as a navigator. How would you go about preparing for the race now that you have secured a berth. The first thing to do is to get the long range picture of the weather. The prevailing weather conditions and wind conditions. This would tell whether you are sailing a reach (running off the wind, such as the race to Honolulu), a run (running downwind, aft of the beam), or a beat (on the wind, "hand on wind"). Now you can decide what equipment to take along. Your pilot charts give the prevailing conditions and your work is done from day to day. All these charts can be attained from the Hydrographic Office in Washington, D. C.

The race is drawing near now and if you were sailing to Spain, for instance, you would be checking present conditions for the "Notice to Mariners" from Boston. This would give you the local present forecast and the expected condition. The week before the race, you travel to the coast to meet the crew and see the boat you're going to cross the Atlantic on.

When did this all start? When did men start pitting themselves against the elements in racing yachts? It all began in 1866. The Great Race of 1866 is what is commonly referred to.

The Vesta, believed by its owners to be the best boat afloat, was a centerboard schooner 105 feet in length to a

beam of 25 feet and a draft of 7 feet, 6 inches, with the centerboard up. It was owned by Pierre Lorillard, who had had her built that June (the year of '66). In a race with the keel schooner *Henrietta,* in a hard breeze, she had won. Mr. P. Lorillard had no doubt that the Vesta could beat any boat afloat.

George and Franklin Osgood had other ideas. They owned the Fleetwing, which was built the year before. She had a length of 106 feet, 7 inches, a beam of 23 feet, 11 inches, and a draft of 11 feet, 11 inches. The Fleetwing had also beat the Henrietta, but with a rounder margin.

Mr. Lorillard disagreed about the quality of the other boat. Both owners had 30,000 dollars a piece to prove their boat was the best. An agreement was arranged to race. It was the month of October so someone suggested that the event be put off till spring. No, let's sail in December when there's wind enough for both boats. Let's not race from Sandy Hook to Cape May but from Sandy Hook to the Isle of Wight, England. This way everyone would get a run for their money.

Three thousand miles across the great Atlantic in December is a chore for a good crew and a stout boat.

The men who put up the money for this great event had their reasons for not going along. But the owner of the Henrietta seemed to be a stouter fellow. He wanted to get in the race but would sail his own ship. His name was James Gordon Bennett, Jr., son of the owner of the *New York Herald.* He gathered together his $30,000 and joined the fleet. The Henrietta measured 107 feet over all, 22 feet in the beam and a draft of 11 feet, 6 inches. She had been in the Civil War and had been many places. Now we had a three cornered race.

90,000 dollars to the winner. Betting was done all over New York. *Fleetwing* was the favorite with odds at four to three. A safe bet says *Vesta* will trail the fleet at odds of one to three.

It was a tough race with six men of the Fleetwing crew being claimed by the sea. Fleetwing had not decked over her cockpit so the sea reached right in and claimed its own. None of the other ships lost any men. The Vesta sighted land first but this didn't win her the race. Fifty minutes later Henrietta picked up the lights of Scill Isles. Vesta threw away her lead by poor pilotage. In maneuvers not recorded, the Vesta lost much time in weathering the dangerous group of islets that constitute the English coast. The Henrietta romped at 13 knots up the channel. At forty minutes past noon of Christmas Day they picked up the pilot that would take them to Cowes. At 3:45 p.m. she passed the Needles in the best of form and won the race in the phenomenal time of 13 days, 21 hours and 45 minutes. The Vesta of course, came in second.

But what had happened to the Fleeting? The following is from her log: "Wednesday, Dec. 19—This day commences with a light breeze from S. S. W. 2 P. M., in all sails, gale increasing with heavy sea. 7 P. M., blowing a gale, running under two-reef foresail and forestaysail. 9 P. M., shipped a sea, which washed six of the crew out of the cockpit; hove to for five hours under two-reef foresail. 2 A. M., kept off; latter part moderate, wind hauling to west, set suaresail. Lat. 47-20, Long. 37-27. Distance run, 199 miles."

The Fleetwing almost didn't make it through that night. There was no hope for the men overboard, but the Fleetwing searched fulfilling humane demands. Fleetwing tore past the Scilly Isles less than seven hours behind the Henrietta. She crossed the finish line at midnight of Christmas Day, only eight hours and fifteen minutes behind the winner. She was a gallant craft.

The Great Race of 1866 was filled with tragedy and elemental savagery contributing to it greatness. In the Fastnet race of 1931, in the Bermuda race in 1932, and in the race to Norway in 1935—men had lost their lives in tribute to the sea. In the race to Honolulu in 1957 a man was overboard also. That was the only incident in the Pacific races.

Sailing has changed much since these giants raced the oceans. Now much smaller boats cross the Atlantic and Pacific in the exciting races. Now boats have time handicaps so that boats of different sizes can compete against each other. If a boat is longer and carries more sail it is expected to make the crossing in a shorter time than a boat which must carry less sail.

What is a modern race like? The Spain race of 1957 was an exciting example of what racing is like today. It was the second race in 30 years to start off from a United States port and finish at Santander, Spain. Four of the boats competing were American-owned, one Cuban (Bill Stanley was aboard this once), one Swedish, one German. All are yawls except Alphard, which was a ketch.

The list of competitors for this are as follows:

"Kay," Sven Frisell (Sweden, 52 ft.)

"White Mist," G. W. Blunt White (U. S., 45 ft.)

"Criollo," Luis Vidana (Cuba, 67 ft.)

"Carina," Richard F. Nye (U. S. 53 ft.)

"Hamburg VI," Dr. Kurt Fischer, Commander of Nazi submarines, (Germany, 56 ft.)

"Alphard," Curtis Bok (U. S. 42 ft.)

"Carina" won the event. Actually "Criollo" came in first but the smaller boat won on corrected time. "Carina" had crossed the finish line in 19 days, 13 hours, and 10 minutes.

Twenty-nine years before, this same line off Cabo Mayor lighthouse at Santander had marked the end of the first trans-Atlantic race for boats that were then considered to be undersized for this journey. The Paul Raymmond's 60-foot schooner "Nina" had won, completing the run in 24 days. But during these intervening years, more than physical aspects of yachting had changed. With Franco in Spain there was no Royal family to meet the boats. The fleet of racing yachts were then 100 or more feet long.

"Criollo" had some exciting action during the cruise. Mr. Stanley said they had all new sails aboard but by the second week two of them had blown out. "Hamburg" was having difficulty houlking together her three spinnakers and "Whate Mist's" crew was sewing the sails together. Carina's sails held together. Alphard had bad weather all the way and came in last. She had the privilege of having the only woman in the fleet aboard. She was Katherine Hoyt, wife of Norris Hoyt, also one of the crew members. She acted as cook. White Mist had her boom shattered by a large wave. Her crew used wood from there bunks to patch her together. Figaro's spinnaker sail collapsed and a gust knocked the 47-foot yacht over and water poured into the cockpit. The crew picked themselves up and pulled out of the list.

The summary of the race reads sometime, then corrected time d.h.m.s.:

Carina 19:13:28:47, 18:02:13:47

Crillo 19:05:25:00, 19:05:25:00

White Mist 21:07:35:20, 19:06:05:-20

Figaro 21:07:44:35, 19:08:36:05

Kay 21:10:21:35, 20:07:43:20

Hamburg 21:04:51:01, 20:08:35:31

Aphard 23:20:09:28, 21:03:51:59

The times may be different and the shapes and sizes of the boats may be different than the Great Race of 1866, but the thrill of sailing the oceans never change.

After you get your degree you can apply your engineering background to navigation (it is only a problem in Plane and Spherical trig) and sail the ocean too. May be someday you'll have enough loot to buy your own boat and gather together a crew. Meanwhile let's don't give up the ship.

STRAIGHT TALK TO ENGINEERS

from Donald W. Douglas, Jr.

President, Douglas Aircraft Co., Inc.

Here at Douglas we're involved in a greatly accelerated missile and space program. This requires one of the most intensive engineering and research efforts in our history.

The problems are great ones as we move into the new dimension of unmanned and manned space vehicles. They require specialists in almost every engineering field. But their solution will result in great benefits not only to our own nation but to all mankind.

If you're interested in tackling these problems with us... in giving your best in an all-out drive to solve them... we're interested in you!

Please write to Mr. C. C. La Vene
Douglas Aircraft Company, Box 600-M
Santa Monica, California

(Continued from Page 15)

be removed in order to make room for the vessels. The Saint Lawrence Seaway Authority and the Saint Lawrence Seaway Development Corporation are building a new high level suspension bridge to replace the old one. The Canadian organization will build the substructure and the American organization will build the superstructure.

A short distance upstream from Cornwall the big powerhouse is being built which will span the driver for a distance of 3,300 feet between the Canadian shore and Barnhart Island.

The 80 foot fall in water level at the powerhouse will be overcome by the Grass River and Eisenhower locks. After passing through these locks ships will travel 25 miles along the newly created lake upstream to Iroquois.

At Iroquois a control dam which will control the flow of the water from Lake Ontario 80 miles upstream is being constructed. To by-pass the dam the Iroquois lock, most westerly of the seven new locks was constructed. To build this lock a high cut had to be made in glacial till almost as heavy as concrete. Massive earth moving equipment was needed to excavate the area and many machines broke down on the tough surface. The lift of the lock is 6 feet. This permits the use of sector type gates which eliminate the need for a complicated filling system.

The Iroquois will provide a passage between the power pool, in the International Rapids Section of the Seaway, and the 1000 Island Section of the St. Lawrence River leading west to Lake Ontario. The Iroquois was the first major completed structure of the seaway. It was given its final test on November 22, 1957, as the Canadian Government ship Grenvill was raised and lowered in the lock chamber.

At the Thousand Islands Section there will be a lowering of the scattered rock shoals to afford a controlling depth of 27 feet with a minimum channel width of 450 feet.

The total drainage area above the foot of the International Rapids section at St. Regis, N. Y., is approximately 303,000 sq. miles, of which 95 sq. miles are water surface. The stream is unique among the rivers of the world in that the tremendous storage capacity of the lakes within the watershed regulates the flow in the river to an unusual extent. The maximum average flow being about 314,000 cubic feet per second. The observed average mean per monthly outflow from 1860 to 1940, inclusive, was 237,000 cubic feet per second and the minimum was 144,000 feet per second.

The major works to be constructed by the United States are located at the International Rapids Section. They comprise 2 lateral canals, including 3 locks to bypass and surmount the new dams to be constructed. These are part of the power project to be built by the Hydroelectric Power Commission of Ontario and the Power Authority of the State of New York. The small portion of this channel that is in Canada will be improved by the Saint Lawrence Seaway Authority.

The third and highest step of this journey is the Welland Canal and locks which rise 327 feet. The canal is being dredged and deepened by dry excavation to provide for better navigation.

The fourth step is the 89 mile journey from the Welland Canal along Lake Erie, Lake St. Clair, and Lake Huron. There is an eight foot rise from the Welland Canal to Sault Ste. Marie at the end of Lake Huron. Due to the length of the waterway no locks are needed to overcome the rise.

If a ship was to by pass the Sault St. Marie locks that lead the route to Duluth, and travel from Lake Huron to Lake Michigan it might come down Lake Michigan to Chicago.

Chicago, the largest railroad center of North America, the greatest trucking center, and the world's aviation capitol, has now become the international port of the world.

By April, 1959, when St. Lawrence Seaway was completed, ocean going vessels from every port of the world traveled through the Great Lakes into Chicago ports. Chicago will become the greatest deep water port on the Great Lakes, St. Lawrence Seaway, and the Mississippi River, with its 7,000 miles of inland waterways. Metropolitan Chicago thus became a part of an inland waterway system extending from the Gulf of Mexico to Montreal. Because of such a strategic position, Chicago is expected to handle 40% of total volume of general cargo in U. S. Great Lakes—overseas trade.

The Chicago Harbor in downtown Chicago, on the Chicago River, is equipped with 50,000 sq. ft. of enclosed dock space, 40,000 sq. ft. of partially enclosed dock space, and 10,000 sq. ft. of open dock space. At Navy Pier preparations are being made to adopt it for ocean going vessels. Two berths suitable for ocean going vessels are being constructed. The south pier is being widened 96 feet for a distance of 1100 feet. Railroad tracks are being installed to permit ship-to-rail transfer of cargo. The existing freight and passenger shed is being repaired. The floor structure is being built and rehabilitated. A new 55 foot wide transit shed will be built along the entire length of the widened pier.

But by far the largest project is in the Calumet region. Here, six miles up the Calumet River, the 2,300 acres of Lake Calumet are being developed into an industrial and commercial port terminal for ocean, lake and inland shipping, as well as a major terminal area for railroads and truck lines. Within the port, channels totalling 70 acres will be dredged to a depth of 21 feet. A steel bulkhead wharf totalling 5,700

(Continued on Page 36)

This aerial picture of the St. Lawrence Power Project shows the adjacent Canadian and United States powerhouses, which merge at the International boundary to form one continuous structure that extends for 3,300 feet between the Canadian mainland (bottom left) and the eastern end of Barnhart Island (upper right). When completed in 1959, this project, built by Ontario Hydro and the Power Authority of the State of New York, will have a maximum capacity of 1,880,000 kilowatts from 32 generators, each plant to house 16 units. (Photo courtesy Ontario Hydro)

(Continued from Page 35)

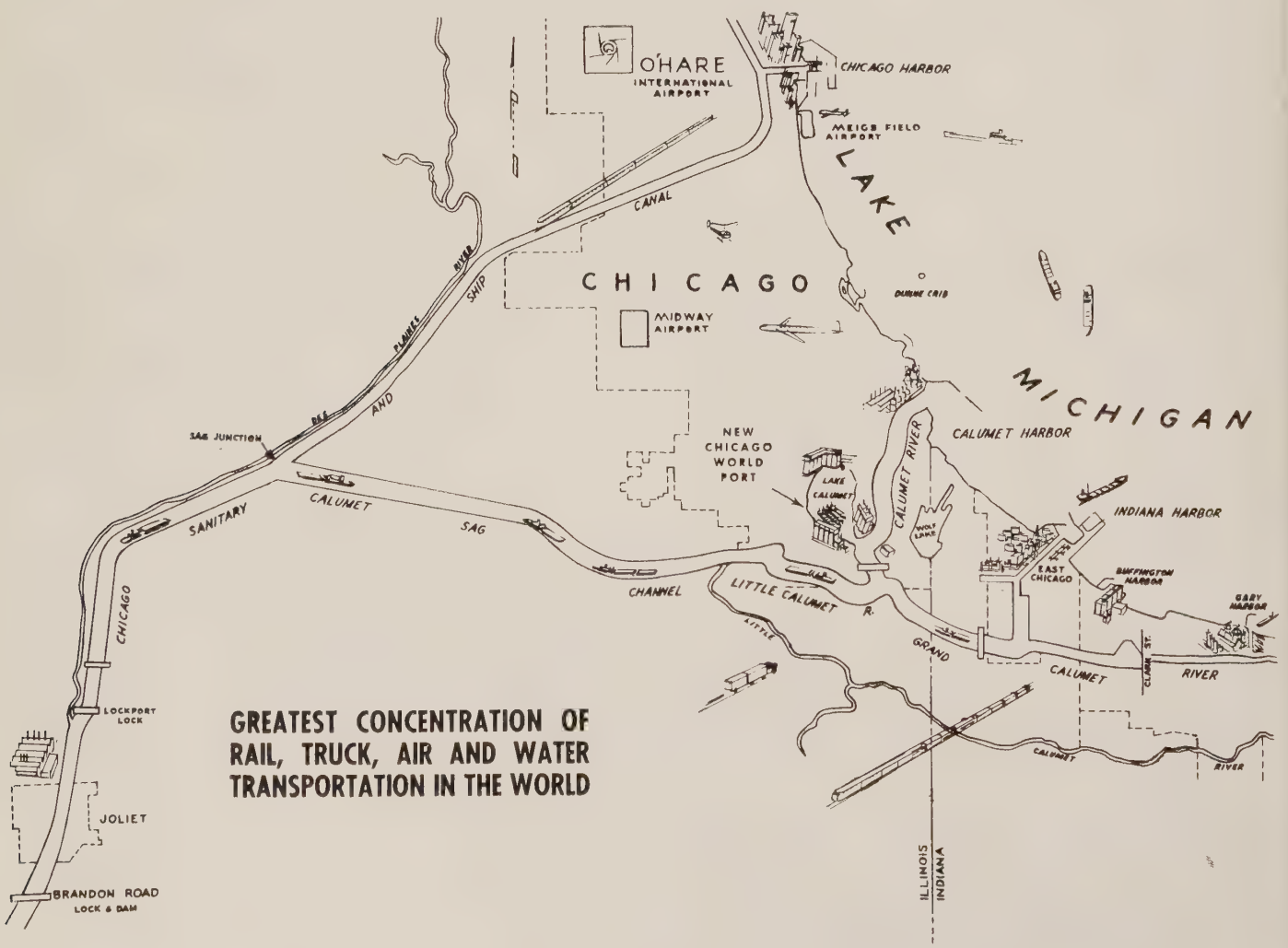
feet will have berths for about 20 of existing Great Lakes-overseas vessels and 12 of the bigger 6,000 to 10,000 ton ships that will travel the seaway. There will be three fireproof one story transit sheds, two with working areas of 72,000 sq. ft. and a third with an area of 172,800 sq. ft. A warehouse for general storage has 100,000 sq. ft. with an unlimited floor load. The two gain elevators each have a capacity of over 6.5 million bushels. Greatness is truly the accent here with a ship-side drive for trucks 6,000 feet long—one of the world's largst concorses. Another giant is a crane with a 110 ton capacity at 45 foot radius, and 38 ton capacity at 125 foot radius. This fully revolving crane is barge mounted, so it can service the entire harbor. It is the largest crane on the Great Lakes.

Boats and barges will find their way from the port at Calumet to the Mississippi River via various canals and rivers which are being prepared to accommodate the new traffic. Work that is being done is: widening ten miles of the Chicago Sanitary and Ship Canal from 160 ft. to 225 ft. from Lockport, Ill., to Sag Junction. Widening of Cal-Sag channel from Sag Junction to the Little Calumet River from 60 feet to 225 feet for the entire distance of 16.2 miles, a channel 225 feet wide and 9 feet deep in the Grand Calumet River from the Little Calumet River to its junction with the Indiana Harbor Canal, a channel 160 feet wide and nine feet deep in the Grand Calumet River from its junction with the Indiana Harbor Canal to Gary, Indiana, two locks, one in the Little Calumet River, and the other in the Grand Calumet River, to regulate the diversion of water from Lake Michigan, and removal of reconstruction of all obstructive bridges throughout the course of the channel. These improvements will be most helpful to the internal waterways of Illinois and Indiana, for they now permit eight barge tows in two by four hookup to pass each other easily. A tow can carry 12,000 tons equal to a 200 car freight train.

With these improvements Chicago will grow and prosper. Chicago Metropolitan wholesale trade is expected to go up from its present average of 16.5 billion annually to 22 billion, and the retail trade from 7.1 billion to 9.5 billion. Since about 50% of nations exports and imports are from the Midwest they must be shipped through Chicago. Thus by 1965 a minimum of 1½ million tons of overseas trade is expected to be handled by the Port of Chicago as compared with 250,000 tons in 1956.

Chicago will then become the hub of the nations inland waterway networks. This coupled with the fact that this city is already the center of the nations railroad, airline and trucking networks will give Chicago the world's most efficient and extensive distribution system. The Midwest, which Chicago serves and which uses Chicago as its gateway, is one of the world's most productive regions. All this goes into a combination which will make Chicago the greatest city in the world, perhaps in the very near future.

We wish to thank the United States Government Printing Office, Mrs. Skiple of the Canadian Consulate in Chicago, and the Chicago Regional Port District for their cooperation.



Why metals corrode...and how to prevent it

The equipment you will design most probably will have to stand up against one or more of these 6 different forms of corrosive attack:

1. General tarnishing or rusting with occasional perforations in highly affected areas.

2. Highly localized attack by pitting.

3. Cracking induced by a combination of stress and corrosion.

4. Corrosion confined to crevices, under gaskets, or washers, or in sockets.

5. Corrosion of one of an alloy's constituents leaving a weak residue.

6. Corrosion near the junction of two different metals.

HOW CORROSION OCCURS

The basic cause of corrosion is the instability of metals in their refined state. Metals tend to revert to their natural states through the processes of corrosion. For example, when you analyze rust, you will find it is iron oxide. When you analyze natural iron ore, you find it, too, is iron oxide.

In all of the six forms of corrosion mentioned above, corrosion has the same basic mechanism. It's similar to the electrochemical action in a dry cell.

The electrolyte in the dry cell corresponds to the corrosive media, which may be anything from the moisture in the air to the strongest alkali or acid.

The plates of the battery correspond to the metal involved in corrosion.

A potential difference between these metals or different areas on the same metal causes electricity to flow between them through the electrolyte and a metallic bridge or contact that completes the circuit.

At the anode, a destructive alteration or eating away of metal occurs when the positively charged atoms of metal detach from the solid surface and enter the solution as ions.

The corresponding negative charges, in the form of electrons, travel through the metal, through the metallic bridge, to the cathode.

Briefly then, for corrosion to occur, there must first be a difference in potential between the metals or areas on the same piece of metal so that electricity will flow between them. Next, a release of electrons at the anode and a formation of metal ions through disintegration of metal at the anode. At the cathode, there must be a simultaneous acceptance of electrons. Action at the anode cannot go on alone, nor can action at the cathode.

CONTROLLING CORROSION

When corrosion occurs because of the differences in electrical potential of dissimilar metals, it is known as galvanic action. Differences in potential from point to point on a single metal surface causes corrosion known as local action.

When you plan against galvanic corrosion it is essential to know which metal in the couple will suffer accelerated corrosion . . . will act as the anode in the corrosion reaction.

The galvanic series table shown below can supply this information. In any couple, the metal near the top of this series will be the anode and suffer accelerated corrosion in a galvanic couple. The one nearer the bottom will be the cathode and remain free from attack or may corrode at a much slower rate.

GALVANIC SERIES TABLE

Magnesium
Magnesium alloys

Zinc

Aluminum 25

Cadmium

Aluminum 17ST

Steel or Iron
Cast Iron

Chromium-iron (active)

Ni-Resist*

18-8 Chromium-nickel-iron (active)
18-8-3 Chromium-nickel-molybdenum-iron (active)

Hastelloy "C"

Lead-tin solders
Lead
Tin

Nickel (active)
Inconel* (active)

Hastelloy "A"
Hastelloy "B"

Brasses
Copper
Bronzes
Copper-nickel alloys
Monel*

Silver Solder

Nickel (passive)
Inconel (passive)

Chromium-iron (passive)

18-8 Chromium-nickel-iron (passive)
18-8-3 Chromium-nickel-molybdenum-iron (passive)

Silver

Graphite
Gold
Platinum

HOW TO USE THE CHART

Notice how the metals are grouped in the galvanic series table. Any metal in one group can be safely used with any other metal in the same group. However, when you start mixing metals from different groups, you may run into serious galvanic corrosion of the metal higher on the list. And the further apart these metals are listed, the worse this corrosion may be.

But, if you have to mix metals, pay particular attention to the electrical contact between them. Eliminate any metallic bridges or contacts of metal to metal that will permit the flow of electrons through them. You can do this by separating the metals physically, or by using insulation or protective coatings. Another factor is the relative areas of the metals in contact with each other. Parts having the smaller area should be of a metal with a lower listing on the galvanic series table than the metal used for the larger area.

When you plan against local action, keep in mind that the corrosion process is similar to galvanic action . . . a movement of electrons from one point on the metal to another. Naturally, the easiest way to avoid local action is to use a metal with little or no impurity . . . or an alloy with constituents that are listed closely on the galvanic series table. Local action on other metals, however, can be controlled by stopping any flow of electrons . . . such as with protective coatings. Environment, too, is a factor for consideration.

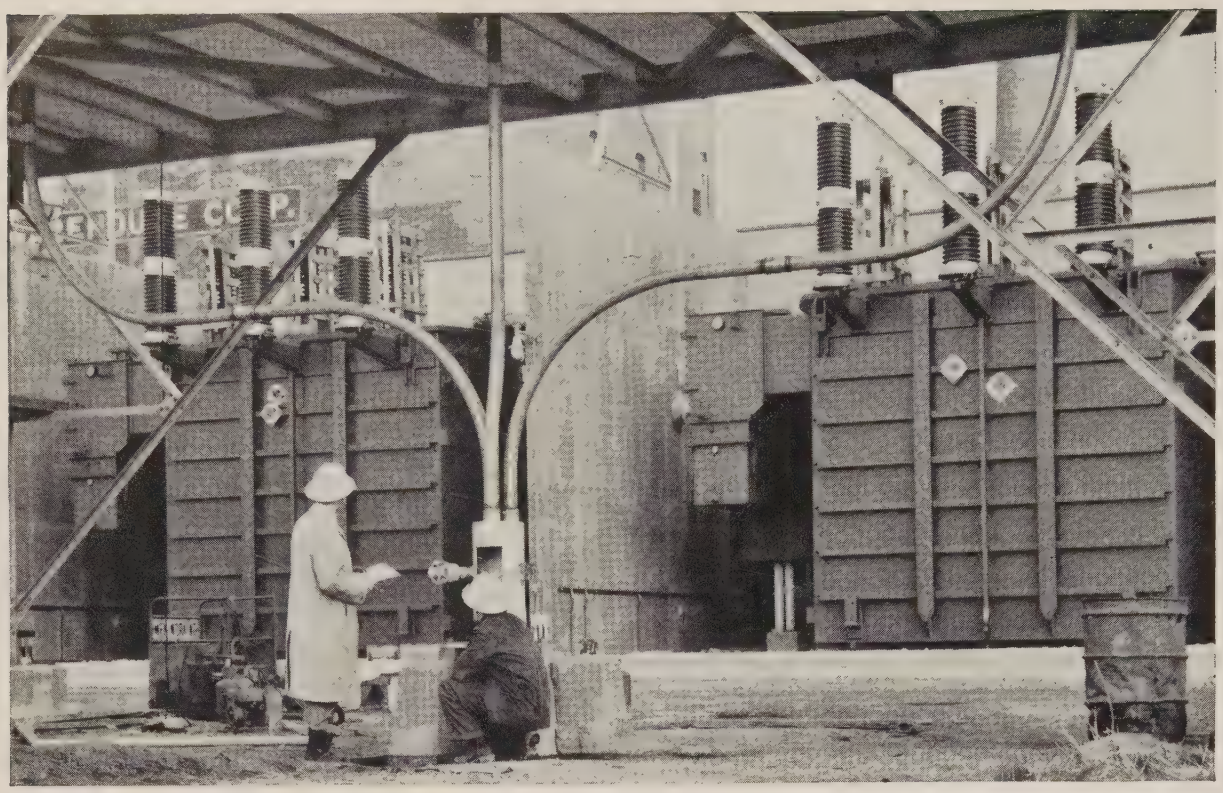
FILM ON CORROSION AVAILABLE TO ENGINEERING CLASSES

Inco's full-color sound film — "Corrosion in Action" — gives a graphic explanation of corrosion and how to control it. The film is in three parts: The Nature of Corrosion, 20 minutes running time; Origin and Characteristics of Corrosion Currents, 26 minutes; Passivity and Protective Films, 17 minutes. 16mm prints can be loaned to engineering classes. For details, write Inco for descriptive folder on "Corrosion in Action."

*Registered trademark

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street INCO New York 5, N. Y.

It takes foresight . . .



It takes *engineering foresight* to meet the needs of a changing and growing power system. Design and construction of new facilities must be based on future demands. The Harbor Substation, located in the industrial and commercial complex surrounding Milwaukee's harbor, is designed to meet the expanding load of this area. This bulk station's design incorporates 138 kv underground cable supply, three 90,000 kva, three winding transformers (with interconnected cooling to expand capacity in case of failure), enclosed metal clad switch gear, and 13.8 kv underground distribution cables. The design of this station reflects one of the many and varied engineering problems confronting the engineers in a growing power utility.

We're looking for men with qualities like these!

Even with skill, foresight, imagination and judgment, a person must find a receptive environment to enable him to exercise and develop these qualities. At Wisconsin Electric Power Company you will find such an environment. You will have a chance to use your engineering skills in a wide variety of fields — electrical, mechanical, civil, chemical, statistical, research, sales, administrative, etc.

Demands for our services are so great that our current expansion program anticipates the doubling of our facilities within a 10 year period. We invite you to grow with us!

WISCONSIN ELECTRIC POWER COMPANY SYSTEM

Wisconsin Electric Power Co.
Milwaukee, Wis.

Wisconsin Michigan Power Co.
Appleton, Wis.

Wisconsin Natural Gas Co.
Racine, Wis.

DOWN TO THE PIER IN BUSES

By Sheldon Altman

I sit now in a quiet, spacious lounge on the Northwestern campus. I can't help but compare the lives of the students of this admired university with the lives of the students at Navy Pier. My assignment is to write a human interest story about the people (engineers in particular) at the Pier. How do our people at the Pier compare with the people at this big private university. People are the same all over, the way they live their lives is where the comparison comes in.

There are a few things we miss at the Pier that should be in any college life. One of these things is the bull session I had with some of the fellows in this dorm last Friday night. We talked on various subjects from religion to politics to women. We miss this chance to talk freely in the evening to people with the same problems trying to find their way in this chaotic world. We go home, eat supper, do homework, and go to bed.

We miss the clean white snow of a big beautiful campus with pretty things trudging across marked paths in the snow. Pretty things with maroon and white head scarves, boy-coats, bulky sweaters, black tights and faces rosy with the bite of winter. Girls. Girls to smile at, to talk your heart out to, to look at—girls with flowing brown hair or blond tresses, and deep pools for eyes where a boy drowns in the liquid white stare.

But what is life at the Pier like? That is the topic of this article. Well, if you're an average student at the Pier you work at an outside job from eight to sixteen hours a week. Accordingly you would try an early schedule with eight o'clock classes three to four times a week. Being an average student you would travel an hour to an hour and a half to school. You would get up at 5:30 or 6:00 o'clock to get to school on time. Your program takes a bad turn somehow and you stay till four, five, or six o'clock in the evening.

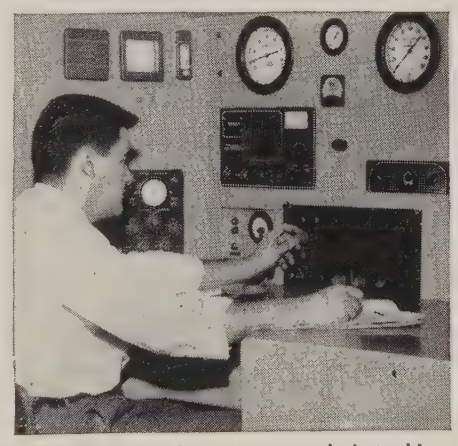
There are many jokes about the Pier in Chicago. You've probably heard all of them. "Harvard on the rocks—the only university that can be torpedoed." There is the story about that one time in a psychology class a pupil who was telling his instructor of being isolated on the east end while the Pier broke in half and started to float out into the lake. This all happened in a nightmare of course. Well I've been there for three complete semesters and my dreams don't get half that bad. At least when it breaks away from shore with me on it, there are also a dozen girls aboard.

I am afraid you are getting the wrong impression, you must think I have a rather cynical apathy towards the Pier. This is all wrong. The Pier is a lovely commuters university which, if nothing else, teaches you survival of the fittest. In the summer you can sit out on the east end and watch the boats sail by and listen to the calm and cooling lake. Inside you have the sunshaded coolness of a fine warehouse. I mentioned survival of the fittest. We at the Chicago Undergraduate Division do not learn this important life trait from any instructor. We learn this trait from the flies and spiders that make the Pier their summer home. The lakefront resort seems to be the ideal breeding place for some of the most ferocious flies ever known to man.

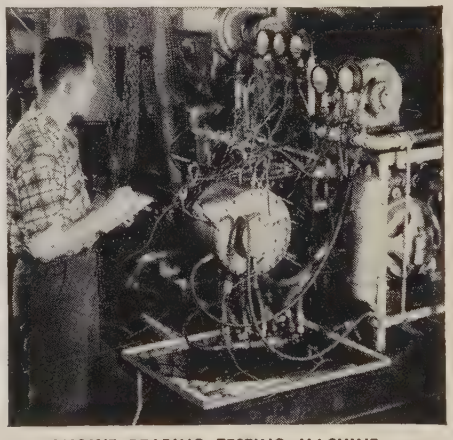
There is the true story of an instructor that became so disgusted with the fly situation he went out for a DDT bomb. This offensive move proved sufficient for a half hour. By the end of the hour there were more flies in that room than students in that whole section of the building.

During the year we at the Pier are visited by a human species apart from its human dignity. This rather odd and perverse species is commonly referred to as the conventioneer.

The conventioneer descends upon the Pier with what I like to compare to marine amphibious warfare. The heavy equipment first bombards the Pier driving us out of the second floor lounge. The trucks thunder overhead delivering the supplies for the oncoming



FATIGUE SPIN RIG uses compressed air to drive balls around the bore of a test cylinder to determine cylinder's static fatigue life.



JET ENGINE BEARING TESTING MACHINE tests main rotor ball bearings under actual operating conditions of load and lubrication.

Fafnir works with "unknowns" to come up with ball bearings you'll need!

In many fields of industry and technology, progress depends in large measure on solving increasingly complex ball bearing problems. Bearing materials and lubricants have yet to be perfected that can take certain temperature extremes. Higher speeds and heavier loads pose formidable problems. So does miniaturization.

To help its research engineers probe the unknowns in these and other areas, The Fafnir Bearing Company maintains the most up-to-date facilities for metallurgical research, and bearing development and testing. It is another reason why you are likely to find Fafnir ready with the answers—should bearing problems some day loom large for *you*. Worth bearing in mind. The Fafnir Bearing Company, New Britain, Connecticut.

Write for booklet, "Fafnir Formula For Solving Bearing Problems" containing description of Fafnir engineering, research, and development facilities.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

hordes. You see, the classes are on the north side of the Pier. The trucks roll over our heads on the upper floor which is a warehouse and which also serves as an exposition space with the south part of the building. Enough said about physical layout of the battle.

The school soon fills with conventioneers. They invade our cafteria, our lounge, our snack shop. There are advantages to this conquest. The only one I can think of though, is the flock of beautiful models brought along to help sell the products.

But life at the Pier isn't all a life and death struggle for survival between insects, conventioneers, and the physics department. We have our lighter moments. In the spring season the Pier area is a beautiful setting with its park area and the people fishing on the west end. The few girls (one for every five boys) look especially attractive to poor engineers who see so few during the school day. We have some social life, including about four dances a semester. There are some fine movies shown free of charge to the students. If you find a girl to walk with, the east end is pleasant and quiet with nothing to disturb you but the sounds of lake. We have many student organizations including a full list of engineering societies.

There is a fine gym to work out in and some interesting convocations. The convocations have included speakers like Bergen Evans, jazz expert Bill Russo, and folk singer Martha Shalme. These convocations and the before mentioned movies are all well attended.

What are classes at the Pier like? For the engineer his freshman classes in general engineering, for example, are heavily overcrowded until about midterm. We have a tremendous number of students leaving the Pier in these first trying months that start the long survival routine. The classes are cut down some making them a bit more comfortable than before. The same situation prevails in the Rhetoric classes.

For some reason engineers have the "screws" turned on in rhetoric. In one class, considerably filled with engineers, the instructor told the class how stupid engineers are and that they can't write a simple theme. I don't think he had the right to make this statement. It isn't true of all engineers at all schools. What is true though, is that many people who come to the Pier couldn't afford to continue their education if there were no Pier. We have to accept everyone here ,people from the bottom half of the class live and work here just as the top ten of a graduating class do. Sometimes these people who couldn't afford a higher education and were low man on the totem pole because of misleading class standings prove themselves because of the chance for an advanced education. As for the would be engineer coming to the Pier in hopes of an easy buck in the near future and wanting nothing of reading "doze" English books, you needn't worry, he is "flunked" out before the end of two or three or even four semesters, and goes to work in a gas station as was ordained originally.

By the time you have reached your fourth semester at the Pier you know all its inuendoes. You have seen many changes in faces and names. You have seen the meager efforts of brightening the warehouse by painting it pale green to gray to pale green. You bare the scars of many tight squeezes for a grade you needed to get off "pro," and you begin to worry about where the money will come for going downstate or to IIT or wherever you plan to go after the Pier. One thing is sure though, you have made it this far, and at the infamous Navy Pier.

The odds are in your favor now, with a little effort you might get a loan, or a decent summer job to carry you through another year. If you have gone through this far you're a veteran in the survival routine. You hope your children will have it easier and if they don't and have to work through at a commuter's school as you have done or are doing, maybe we will win out and a four-year Chicago Undergraduate School will be supplied with a decent education at a price they can afford.

To students who want to be SUCCESSFUL highway engineers

There's a real need for qualified men in America's 100 billion dollar highway program. It's a big job. For example, for the new Interstate Highway System **alone,** 35,000 miles are still to be built.

Choice assignments await engineers at every level. They will go to the men who prepare for them.

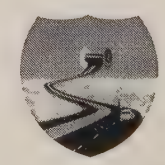
As part of that preparation, you must have basic material on Asphalt Technology. **For if you don't know Asphalt, you don't know your highways.** Asphalt is the modern paving for today's and tomorrow's roads. Asphalt surfaces more than 4/5ths of all roads and streets in the country.

We have put together a special student portfolio to meet that need for information on Asphalt. It covers the Asphalt story, origin, uses, how it is specified for paving . . . and much more. It is a worthwhile, permanent addition to your professional library.

It's yours, free. Send for it today. Prepare now for your future success.

THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland



Gentlemen:

Please send me your free student portfolio on Asphalt Technology.

NAME_____ CLASS_____

ADDRESS_____

CITY_____ STATE_____

SCHOOL_____

He's an Allis-Chalmers Engineer

He has confidence born of knowing where he's going and how he's going to get there. The graduate training program at Allis-Chalmers helped him decide on a *specific* career — and he had a choice of many. He knows his future is bright because Allis-Chalmers serves the growth industries of the world . . . produces the widest range of industrial equipment. He is confident of success because he is following a successful pattern set by Allis-Chalmers management.

Here is a partial list of the unsurpassed variety of career opportunities at Allis-Chalmers:

Types of jobs

Research
Design
Development
Manufacturing
Application
Sales
Service

Industries

Agriculture
Cement
Chemical
Construction
Electric Power
Nuclear Power
Paper
Petroleum
Steel

ALLIS-CHALMERS

A-5882

Equipment

Steam Turbines
Hydraulic Turbines
Switchgear
Transformers
Electronics
Reactors
Kilns
Crushers
Tractors
Earth Movers
Motors
Control
Pumps
Engines
  Diesel
  Gas

Fields

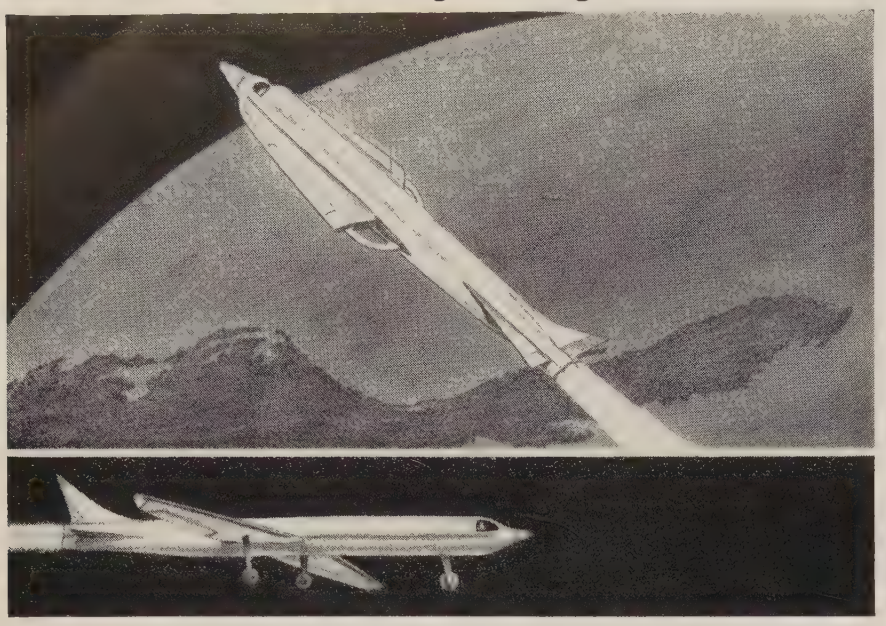
Metallurgy
Stress Analysis
Process Engineering
Mechanical Design
High Voltage Phenomena
Nucleonics
Electronics
Hydraulics
Insulation, Electrical
Thermodynamics

American Airlines

from GTC to "VIP"

The graduate training course helps you decide on your "Very Important Position," by giving you up to two years of theoretical and practical training. This course has helped set the pattern of executive progress since 1904. For details write to Allis-Chalmers, Graduate Training Section, Milwaukee 1, Wisconsin.

MARS outstanding design **SERIES**

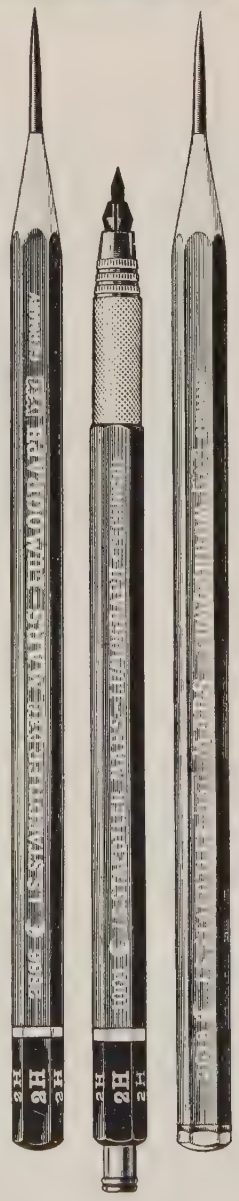


brings 'em back alive

Today's burning problem in space flight is how to ease a rocket safely back to earth, without being consumed by the metal-melting friction of our dense atmosphere. Design Engineer Carl J. Rauschenberger's ingenious suggestion is a pair of wings, locked forward at blast-off, later folded back into flying position (insert) by hydraulic cylinder controls for a slow, safe descent. Mr. Rauschenberger also envisions a retractable glass nose cone, heatproof to withstand the take-off, drawn back to admit air to a jet engine on the return flight.

This outstanding solution to a timely design problem may already exist in working drawings on somebody's drafting board, or even in mock-up form. But whether a project is developed today, tomorrow or the year after next, it will always be important to shape ideas into realities with the best of drafting tools.

In pencils, of course, that means Mars, long the standard of professionals. Some outstanding new products have recently been added to the famous line of Mars-Technico push-button holders and leads, Lumograph pencils, and Tradition-Aquarell painting pencils. These include the Mars Pocket-Technico for field use; the efficient Mars lead sharpener and "Draftsman" pencil sharpener with the adjustable point-length feature; Mars Lumochrom, the color-drafting pencils and leads that make color-coding possible; the new Mars Non-Print pencils and leads that "drop out" your notes and sketches when drawings are reproduced.



The 2886 Mars-Lumograph drawing pencil, 19 degrees, EXEXB to 9H. The 1001 Mars-Technico push-button lead holder. 1904 Mars-Lumograph imported leads, 18 degrees, EXB to 9H. Mars-Lumochrom color-drafting pencil, 24 colors.

J.S. STAEDTLER, INC.
HACKENSACK, NEW JERSEY

at all good engineering and drawing material suppliers

from Deep space to Ocean floor

Vought offers this range to the young engineer

At Chance Vought the engineer's assignments range from the depths of the ocean to the farthest reaches of space . . . from hardware operating aboard the Navy's nuclear-armed submarines to space research vehicles still on the boards.

Here the engineer contributes to projects such as the record-smashing *Crusader* jet fighter series . . . the *Regulus* missiles . . . and advanced weapons, details of which are still classified.

Under the guidance of the Vought engineer, such weapons take shape. He supervises critical tests, and he introduces the weapons to the men with whom they will serve.

Engineers with many specialties share these experiences. Today, for example, Vought is at work on important projects involving:

SPACECRAFT AND ASTRONAUTICS
ADVANCED PROPULSION METHODS
ELECTRONICS DESIGN AND MANUFACTURE
ANTISUBMARINE WARFARE

Vought's excellent R&D facilities help the engineer through unexplored areas. And by teaming up with other specialists against mutual challenges, the Vought engineer learns new fields while advancing in his own.

Would you like to know what men with *your* training are doing at Vought . . . what *you* can expect of a Vought career?

For full information, see our representative during his next campus visit.

Or write directly to:

C. A. Besio
Supervisor, Engineering Personnel
Dept. CM-15

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

NEW VOUGHT CRUSADER FOR FLEET NEXT YEAR!

Navy orders fourth version of flexible, economical fighter

For the fourth time in three years, a new *Crusader* type is extending the power of the Fleet. Chance Vought's F8U-2N has been ordered by the Navy for delivery next year. It will deploy alongside the Navy's swiftest photoplanes and two first line day fighters — all *Crusaders*.

The F8U-2N is another step in *Crusader* growth. Speed of this newest version has been advanced to near Mach 2. It will carry the deadliest air-to-air missiles. It is instrumented and radar-equipped for supersonic combat in darkness or bad weather.

This will be a new capability for the Fleet. Yet it is being acquired at low risk and cost. The F8U-2N's basic design has been proved simple, serviceable and economical . . . compiling an enviable performance record in a year of foreign duty with two Fleets.

Again, the growth provisions of the Vought *Crusader* have provided immediate, low-cost upgrading of the Fleet's aircraft inventory.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

Here's how PPG research put more FUN in boating

Take your pick—water skiing, skin diving, or just skimming along the surface. Afloat, boats mean fun. But there's a big difference ashore. Some boats demand wearisome hours of work—caulking, repainting, replanking. And here's where PPG•research comes in. Thanks to hulls made from PPG Selectron® and Fiber Glass, boat owners never have to worry about upkeep and costly repairs. PPG Fiber Glass hulls can't peel, can't rot or corrode. And what a beating their one-piece construction can take! There are no seams. No nails. No screws. No rivets to rust or loosen. There's new styling freedom, too. Boats of PPG Fiber Glass can take any shape, yet they're strong, light and durable.

Fiber Glass and Selectron polyester resins are just two of a long roster of products developed from the many facets of PPG's research. Every day, the scientists and engineers at PPG work toward developing new products and new applications for established products to benefit our living in countless ways. Right now, long range research is being directed toward finding new uses for Selectron resins and Fiber Glass, toward screening and improving original ideas and molding them into practical applications. The possibilities are endless.

PPG's versatile products offer exciting career possibilities. So, if you want a career with challenging opportunities and a real and rewarding future, find out about your place at Pittsburgh Plate Glass Company. Write to: Manager of College Relations, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

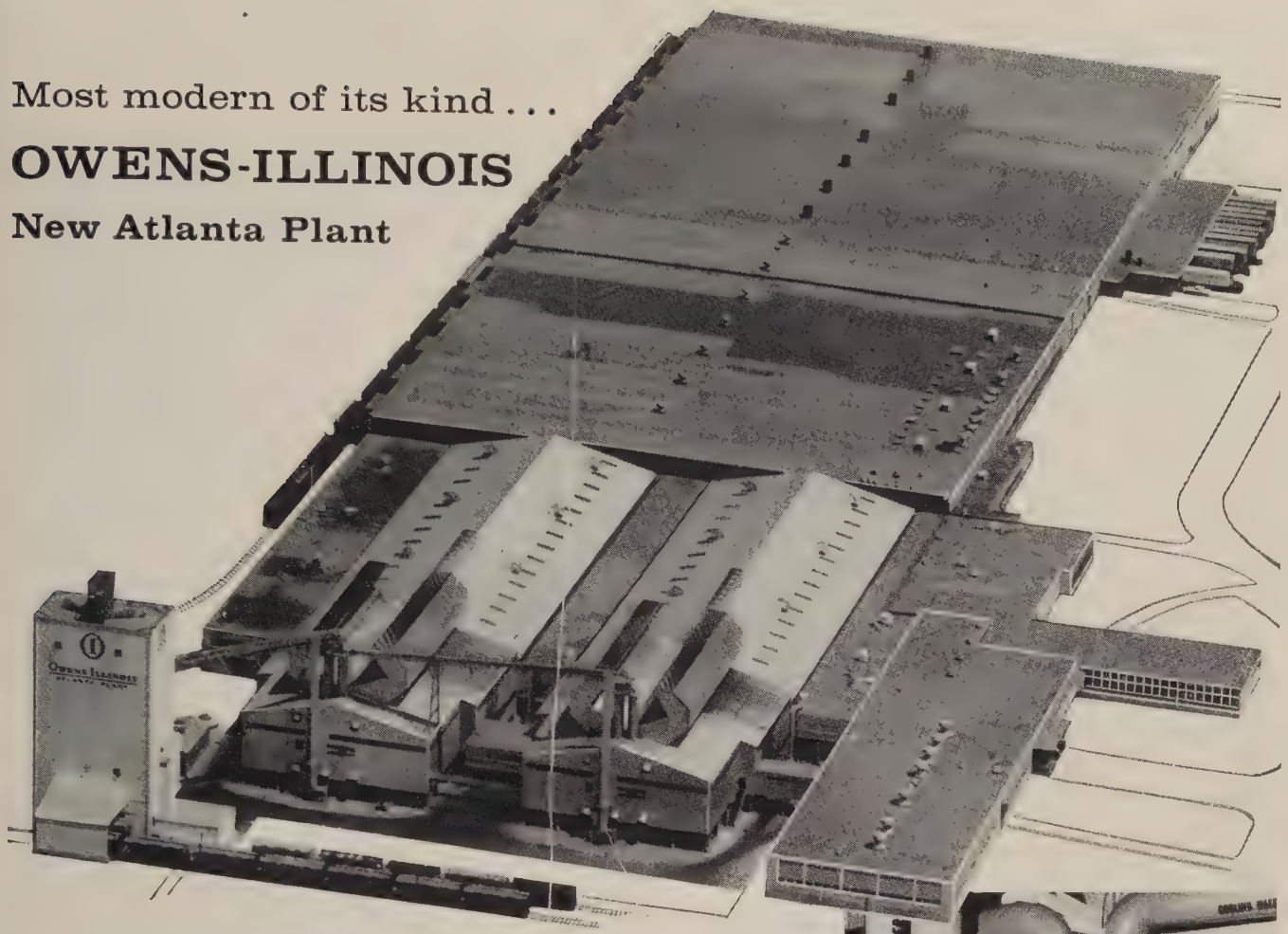
PITTSBURGH PLATE GLASS COMPANY

and its wholly-owned subsidiary COLUMBIA-SOUTHERN CHEMICAL CORPORATION

Most modern of its kind . . .

OWENS-ILLINOIS

New Atlanta Plant



Architects and Engineers: Robert and Company Associates, Atlanta, Ga.

General Contractor: George A. Fuller Company, Altanta, Ga.

Mechanical Contractor: Standard Engineering Company of Washington, D.C.

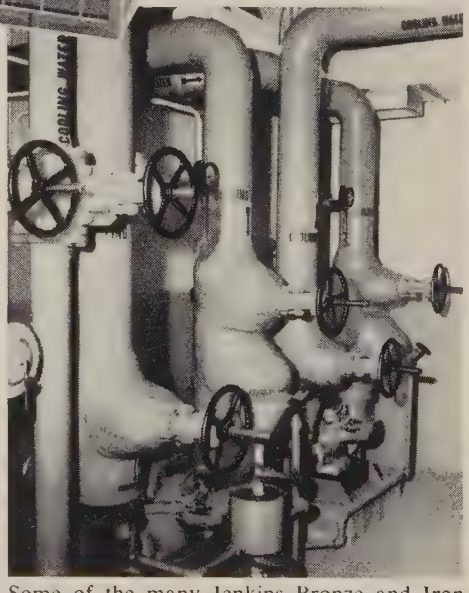
JENKINS VALVES control important service lines

DESIGNED to be the most modern glass container plant in the world, covering 619,000 square feet and highly automated, this new Owens-Illinois plant can produce millions of glass containers annually.

In the glass manufacturing operations trouble-free service piping lines are an essential. Cooling operations require a flow of recirculated water equal to 2-million gallons per day. The furnaces consume about 3-million cubic feet of natural gas per day.

The fact that Jenkins Valves, in large numbers, are used to control water, gas, steam, compressed air and air conditioning lines in this new plant will not surprise most experienced architects, engineers and contractors. For nearly a century, "JENKINS" has been a common specification to assure maximum reliability.

It will pay you to have this important assurance when you specify or install valves . . . especially since Jenkins Valves cost no more. Jenkins Bros., 100 Park Avenue, New York 17.



Some of the many Jenkins Bronze and Iron Valves which control the complex service piping system in the Owens-Illinois plant.

Sold Through Leading Distributors Everywhere

JENKINS

LOOK FOR THE JENKINS DIAMOND

VALVES

JENKINS SINCE 1864

Jenkins Bros

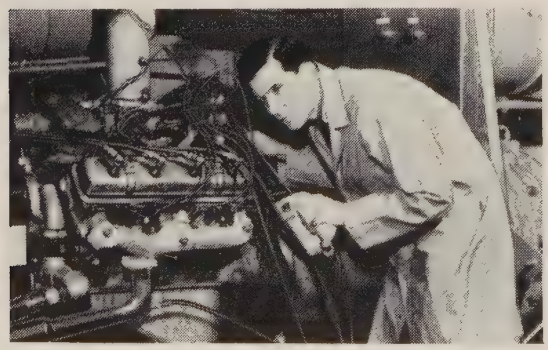
The story of Standard Oil's contributions to oil progress through research is told to the public in advertisements like this during the year.

When a boy asks "WHY?" ...anything can happen!

This scene can be duplicated thousands of times throughout the country. And as long as it goes on, America can be sure of continued progress. Here Bob Hansen (left) and two friends explore the mechanical wonders of an engine (1933 model). The two other boys are Tony Riccardi (center) and Bill Hess. They are all students at Niles Township High School, Skokie, Illinois.

Ever since Bob Hansen was old enough to hold a wrench, he has been tinkering with machines. Next year his repair shop on his driveway at home will disappear because Bob, an honor student, is going to college to study engineering.

Bob is one of thousands of American boys with a restless curiosity about things mechanical. What makes a clock tick? What makes a bicycle brake hold? What makes a car run? From such curiosity comes the mechanical progress that has helped to make America great.



The efficiency of gasoline and lubricants is improved constantly in Standard Oil's huge automotive laboratory in Whiting, Indiana. Here fuels are designed, too, for automobiles that will not be on the street until five years from now. Robert W. Boydston, above, is working on a "fuels of the future" experiment.

In Standard Oil's big automotive laboratory in the research center at Whiting, Indiana, engineers are going through a similar process every day—asking questions and finding answers. How do fuel additives affect combustion? How do they affect engine deposits? How do burning rates differ?

And the questions continue outdoors, too. In all kinds of weather—hot, cold, wet, dry, low barometer, high barometer—different blends of gasoline are tried to see what happens under what conditions. Fuels are designed in the laboratories for experimental engines that won't appear in an automobile for five years. Standard Oil products are under constant improvement to give the finest performance possible. You get years-ahead quality with Standard Oil products—and at a reasonable cost.

Where does progress start? Does it start on the private driveway of a boy's home or in a huge research laboratory? Progress starts whenever someone asks "Why?" and sets out to find an answer.

What makes a company a good citizen?

Perhaps even more than an individual, a company must have a healthy respect for the future. Many companies, like Standard Oil, have large families—tens of thousands of people who depend on Standard for their livelihood. Progress through research is one way of protecting the future of both employees and investors and of helping to assure economic stability for the communities in which they live and work.

STANDARD OIL COMPANY

STANDARD

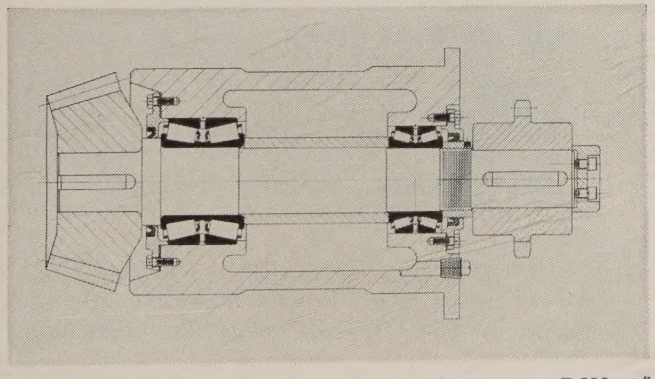
THE SIGN OF PROGRESS... THROUGH RESEARCH

How to keep the world's largest clock sign turning on time

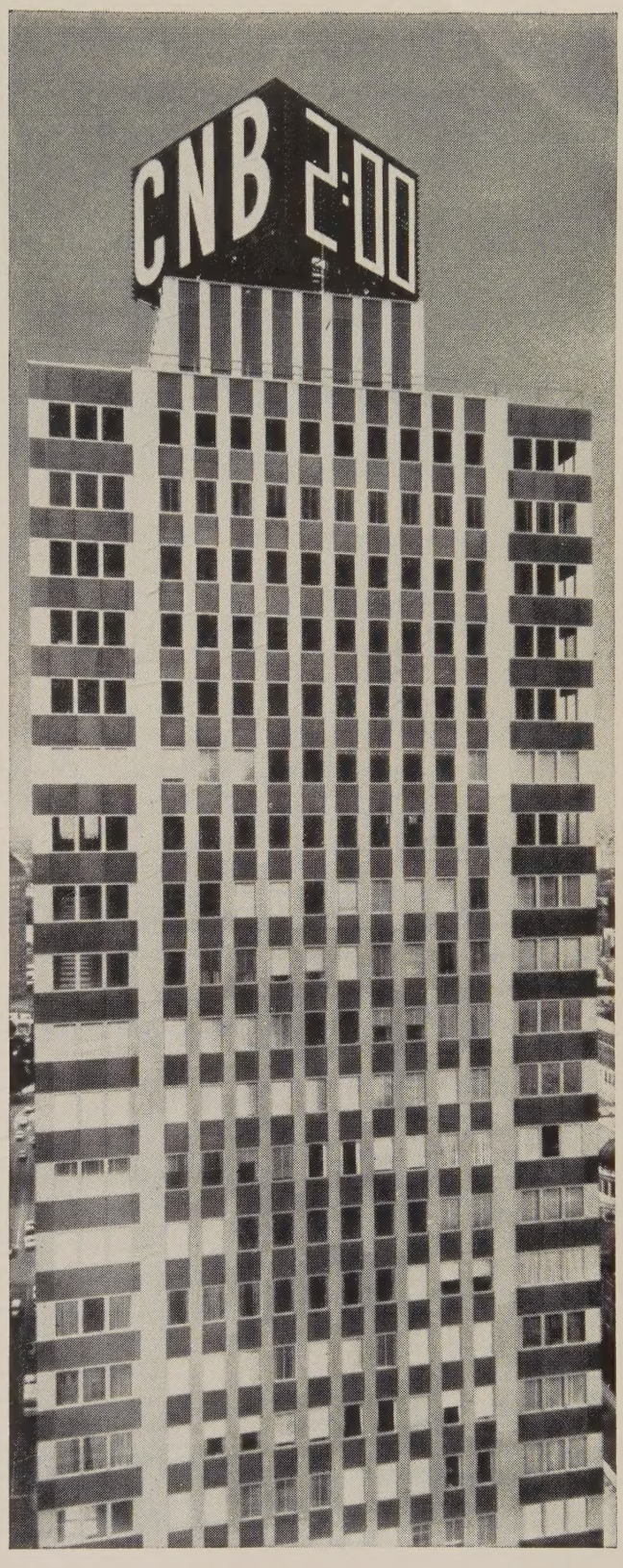
THIS revolving clock sign, the world's largest, weighs in excess of 77 tons, has numerals 25 ft. high. And it turns day and night atop the Continental National Bank in Fort Worth, Texas. To keep this giant clock turning, the engineers specified two double-row Timken® tapered roller bearings for the Brewster RSH 18″ Rotary Table which turns the clock.

Timken bearings are used because the full-line contact between their rollers and races gives extra load-carrying capacity. Their tapered construction lets them take both radial and thrust loads in any combination. And Timken bearings are geometrically designed and precision-made to roll true. They practically eliminate friction.

Timken bearings solve countless problems wherever wheels and shafts turn. Problems that you may face in your future job in industry. Our engineers will be ready to help you. And if you're interested in a rewarding career with the world's largest maker of tapered roller bearings and removable rock bits, the leader in special fine alloy steel, send for our free booklet: "Better-ness and your Career at The Timken Company". Write Mr. Russ Proffit, The Timken Roller Bearing Company, Canton 6, Ohio.

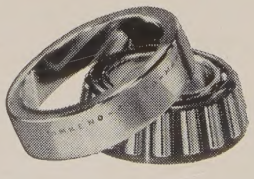


How Timken bearings are mounted in the Brewster RSH 18″ Rotary Table to take heavy loads, assure easy-rolling dependable performance.



BETTER-NESS rolls on

TIMKEN®



tapered roller bearings

First in bearing value for 60 years

Begged, Borrowed, and . . .

Edited by The Staff

The Southern father was introducing his family of boys to a visiting governor.

"Seventeen boys," exclaimed the father, "and all Democrats—except John, the little rascal. He got to readin'."

* * *

And then there was the condemned golfer who asked the hangman, "Mind if I take a couple of practice swings?"

* * *

Soaked: "I got a bottle of gin for my wife."
Buddy: "Sounds like a good trade."

* * *

"What sort of part does Pete have in the play?"
"A very emotional part. In the last act he has to refuse a drink."

* * *

See the happy moron,
He doesn't give a damn.
I wish I were a moron—
My god, perhaps I am!

* * *

Little girls count on their fingers; big girls count on their legs.

* * *

A small boy's voice came from the other side of the fence.

"Please Mrs. Brown, may I have my arrow back?"
"Certainly, where is it?"
"Stuck in your cat."

* * *

Voice in a darkened theater: "Take your hand off my knee. No, not you, you."

* * *

The E. E.'s Lament

Through the smoke and ozone fumes
The student slowly rises.
His hair is singed, his face is black,
His partner he despises.
He shakes his head and says to him
With words so softly spoken,
"The last thing you said to me
'I'm sure the switch is open'."

* * *

Police Sergeant: "College student, eh?"
Prisoner: "Yes, sir."
Patrolman: "It's a stall. I searched his pockets and found money in them."

* * *

The professor who comes in 15 minutes late is rare; in fact, he is in a class by himself.

* * *

God made a machine, the machine made men.
Doctors, lawyers, priests, and then
The Devils got in and stripped the gears
And turned out the first bunch of engineers.

"Adultery is as bad as murder. Isn't that so, Siste Brown," shouted the evangelist.

"I don't rightly know," replied Sister Brown. "I neve killed anybody."

* * *

An M.E.'s father paid is son a surprise visit at schoo Arriving at 1 a.m. he banged on the house door. A voic from the second floor yelled, "Whadda ya want?" Th father answered, "Does Joe Jones live here?" The voic answered, "Yeah, bring him in."

* * *

Shapely Coed: "Honey, you don't mind if I wear velve instead of silk, do you?"

Engineer: "No, dear, I'll love you through thick an thin."

* * *

Frosh: "My roommate says there are some things a gir shouldn't do before twenty."

Soph: "Well, personally, I don't like a large audienc either."

* * *

Mother: "Why did you take so much time last nigh saying goodbye to that fellow?"

Daughter: "But, Mother, if a guy takes you to th movies you ought to at least kiss him goodnight."

Mother: "I thought you went to the Stork Club."

Daughter: "I did."

* * *

Captain to man leaning over the rail of the ship: "I see you have a weak stomach."

Seasick A. S.: "I don't know about that sir. I'm throwing it as far as anyone else."

* * *

First Drunk: "We're getting close to town."
Second Drunk: "How do you know?"
First Drunk: "We're hitting more people."

* * *

It's remarkable how much fun you can get laughing at the picture on your ID card before realizing that's what you really look like.

* * *

A man never knows if he likes bathing beauties until he's bathed one.

* * *

Engineer: "I've got a wonderful girl but I haven't got the courage to tell her how much I love her."

"What's the matter? She doesn't look dangerous."

"I know, but have you ever seen my wife?"

* * *

From a local paper: The Sunday night church service will feature special songs by the choir. The sinning should be very good as at the rehearsal yesterday everyone seemed to be in especially good vice.

1 By setting templates of standard components on photo-sensitive paper and exposing it, hours of hand drafting are saved.

2 With this plotter, stereo aerial photos become contour maps, show highway routes, mineral-bearing formations, volume of coal piles.

3 Slides give the sales staff quick understanding of the engineering superiority of their product—equip them with facts for their customers.

4 Photographs of freight cars as loaded and as received provide information for engineers to develop better loading practices (as well as data for damage claims).

From drawing board to shipping platform...

Photography works for the engineer

Whatever your field, you will find photography increasing in importance. It works for the research scientist, the production engineer, the sales executive, the administrator. It speeds engineering, expedites quality control. It trains, and teaches, and sells. It will help you in whatever you do.

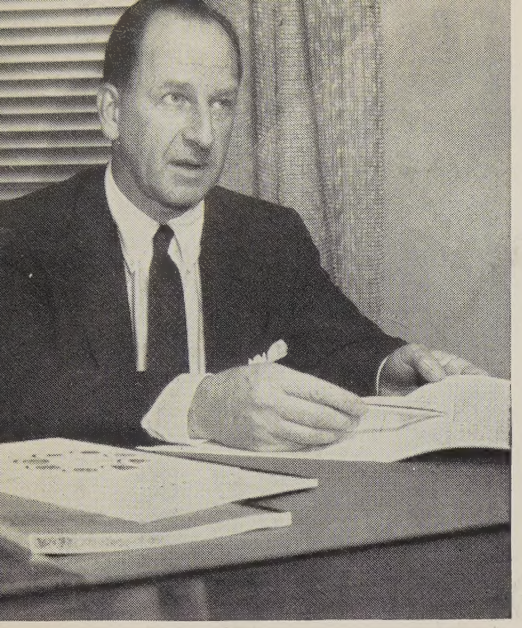
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

Careers with Kodak

With photography and photographic processes becoming increasingly important in the business and industry of tomorrow, there are new and challenging opportunities at Kodak in research, engineering, electronics, design, and production.

If you are looking for such an interesting opportunity, write for information about careers with Kodak. Address: Business and Technical Personnel Department, Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADEMARK



One of a series

Interview with General Electric's Hubert W. Gouldthorpe Manager—Engineering Personnel

Your Salary

Although many surveys show that salary is not the prime factor contributing to job satisfaction, it is of great importance to students weighing career opportunities. Here, Mr. Gouldthorpe answers some questions frequently asked by college engineering students.

Q. Mr. Gouldthorpe, how do you determine the starting salaries you offer graduating engineers?

A. Well, we try to evaluate the man's potential worth to General Electric. This depends on his qualifications and our need for those qualifications.

Q. How do you evaluate this potential?

A. We do it on the basis of demonstrated scholarship and extra-curricular performance, work experience, and personal qualities as appraised by interviewers, faculty, and other references.

Of course, we're not the only company looking for highly qualified men. We're alert to competition and pay competitive salaries to get the promising engineers we need.

Q. When could I expect my first raise at General Electric?

A. Our primary training programs for engineers, the Engineering Program, Manufacturing Program, and Technical Marketing Program, generally grant raises after you've been with the Company about a year.

Q. Is it an automatic raise?

A. It's automatic only in the sense that your salary is reviewed at that time. Its amount, however, is not the same for everyone. This depends first and foremost on how well you have performed your assignments, but pay changes do reflect trends in over-all salary structure brought on by changes in the cost of living or other factors.

Q. How much is your benefit program worth, as an addition to salary?

A. A great deal. Company benefits can be a surprisingly large part of employee compensation. We figure our total benefit program can be worth as much as 1/6 of your salary, depending on the extent to which you participate in the many programs available at G.E.

Q. Participation in the programs, then, is voluntary?

A. Oh, yes. The medical and life insurance plan, pension plan, and savings and stock bonus plan are all operated on a mutual contribution basis, and you're not obligated to join any of them. But they are such good values that most of our people do participate. They're an excellent way to save and provide personal and family protection.

Q. After you've been with a company like G.E. for a few years, who decides when a raise is given and how much it will be? How high up does this decision have to go?

A. We review professional salaries at least once a year. Under our philosophy of delegating such responsibilities, the decision regarding your raise will be made by one man —the man you report to; subject to the approval of only one other man —his manager.

Q. At present, what salaries do engineers with ten years' experience make?

A. According to a 1956 Survey of the Engineers Joint Council*, engineers with 10 years in the electrical machinery manufacturing industry were earning a median salary of $8100, with salaries ranging up to and beyond $15,000. At General Electric more than two thirds of our 10-year, technical college graduates are earning above this industry median. This is because we provide opportunity for the competent man to develop rapidly toward the bigger job that fits his interests and makes full use of his capabilities. As a natural consequence, more men have reached the higher salaried positions faster, and they are there because of the high value of their contribution.

I hope this answers the question you asked, but I want to emphasize again that the salary *you* will be earning depends on the value of *your* contribution. The effect of such considerations as years of service, industry median salaries, etc., will be insignificant by comparison. It is most important for you to pick a job that will *let* you make the most of your capabilities.

Q. Do you have one salary plan for professional people in engineering and a different one for those in managerial work?

A. No, we don't make such a distinction between these two important kinds of work. We have an integrated salary structure which covers both kinds of jobs, all the way up to the President's. It assures pay in accordance with actual individual contribution, whichever avenue a man may choose to follow.

*** We have a limited number of copies of the Engineers Joint Council report entitled "Professional Income of Engineers—1956." If you would like a copy, write to Engineering Personnel, Bldg. 36, 5th Floor, General Electric Company, Schenectady 5, N. Y.** 959-7

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